Adaptec

INSTALLATION AND USER'S GUIDE

ADAPTEC SATA AND SCSI RAID CONTROLLERS

Adaptec SATA and SCSI RAID Controllers

Installation and User's Guide

Adaptec Customer Support

If you have questions about installing or using your Adaptec product, check this document first—you will find answers to most of your questions here. If you need further assistance, use the support options listed below.

Technical Support Identification (TSID) Number

■ Before contacting Technical Support, you need your unique 12-digit TSID number. The TSID number identifies your product and support status.

■ The TSID number is included on a white, bar-coded label, like the example below..

THIS TSID NUMBER WILL BE REQUIRED WHEN CONTACTING TECHNICAL SUPPORT.	TSID: **PTNNNNNNYYWW** (1P) PRODUCT P/N: PPPPPPPPPPPPPPPP ‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ (S) PRODUCT S/N: XXXXXXXXXXXXXX ‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖

■ Affix a copy of the TSID label to the CD jacket so that you don't lose it.

Support Options

■ Search the Adaptec Support Knowledgebase (ASK) at ask.adaptec.com for articles, troubleshooting tips, and frequently asked questions for your product.

■ For support via Email, submit your question to Adaptec's Technical Support Specialists at ask.adaptec.com.

North America

■ Visit our Web site at www.adaptec.com.

■ For information about Adaptec's support options, call +1 408-957-2550, 24 hours per day, 7 days per week. To speak with a Technical Support Specialist,

  ■ For **Hardware** products call +1 408-934-7274, Monday to Friday, 3:00 A.M. to 5:00 P.M., Pacific Time.

  ■ For **RAID and Fibre Channel** products call +1 321-207-2000 , Monday to Friday, 3:00 A.M. to 5:00 P.M., Pacific Time.

  To expedite your service, have your computer in front of you.

■ To order Adaptec products, including accessories and cables, call +1 408-957-7274. Or, you can order cables online at www.adaptec.com/buy-cables.

Europe

- Visit our Web site at www.adaptec-europe.com.
- **German:** To speak with a Technical Support Specialist, call +49 89 43 66 55 22, Monday to Friday, 9:00 to 17:00, CET. For support via e-mail, submit your question to Adaptec's Technical Support Specialists at ask-de.adaptec.com.
- **French:** To speak with a Technical Support Specialist, call +49 89 43 66 55 33, Monday to Friday, 9:00 to 17:00, CET. For support via e-mail, submit your question to Adaptec's Technical Support Specialists at ask-fr.adaptec.com.
- **English:** To speak with a Technical Support Specialist, call +49 89 43 66 55 44, Monday to Friday, 9:00 to 17:00, GMT. For support via e-mail, submit your question to Adaptec's Technical Support Specialists at ask.adaptec.com.
- You can order Adaptec cables online at www.adaptec.com/buy-cables.

Japan

- Visit our Web site at www.adaptec.co.jp.
- To speak with a Technical Support Specialist, call +81 3 5308 6120 Monday–Friday, 9:00 A.M. to 12:00 P.M and 1:00 P.M. to 6:00 P.M.

Limited 3-Year Hardware Warranty

1. Adaptec, Inc. ("Adaptec") warrants to the purchaser of this product that it will be free from defects in material and workmanship for a period of three (3) years from the date of purchase. If the product should become defective within the warranty period, Adaptec, at its option, will repair or replace the product, or refund the purchaser's purchase price for the product, provided it is delivered at the purchaser's expense to an authorized Adaptec service facility or to Adaptec.

2. Repair or replacement parts or products will be furnished on an exchange basis and will either be new or reconditioned. All replaced parts or products shall become the property of Adaptec. This warranty shall not apply if the product has been damaged by accident, misuse, abuse or as a result of unauthorized service or parts.

3. Warranty service is available to the purchaser by delivering the product during the warranty period to an authorized Adaptec service facility or to Adaptec and providing proof of purchase price and date. The purchaser shall bear all shipping, packing and insurance costs and all other costs, excluding labor and parts, necessary to effectuate repair, replacement or refund under this warranty.

4. For more information on how to obtain warranty service, write or telephone Adaptec at 691 South Milpitas Boulevard, Milpitas, CA 95035, (800) 959-7274.

5. THIS LIMITED WARRANTY DOES NOT EXTEND TO ANY PRODUCT WHICH HAS BEEN DAMAGED AS A RESULT OF ACCIDENT, MISUSE, ABUSE, OR AS A RESULT OF UNAUTHORIZED SERVICE OR PARTS.

6. THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESS WARRANTIES WHICH NOW OR HEREAFTER MIGHT OTHERWISE ARISE RESPECT TO THIS PRODUCT. IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT SHALL (A) HAVE NO GREATER DURATION THAN 3 YEARS FROM THE DATE OF PURCHASE, (B) TERMINATE AUTOMATICALLY AT THE EXPIRATION OF SUCH PERIOD AND (C) TO THE EXTENT PERMITTED BY LAW BE EXCLUDED. IN THE EVENT THIS PRODUCT BECOMES DEFECTIVE DURING THE WARRANTY PERIOD, THE PURCHASER'S EXCLUSIVE REMEDY SHALL BE REPAIR, REPLACEMENT OR REFUND AS PROVIDED ABOVE. INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION LOSS OF DATA, ARISING FROM BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ARE NOT THE RESPONSIBILITY OF ADAPTEC AND, TO THE EXTENT PERMITTED BY LAW, ARE HEREBY EXCLUDED BOTH FOR PROPERTY DAMAGE, AND TO THE EXTENT NOT UNCONSCIONABLE, FOR PERSONAL INJURY DAMAGE.

7. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS, AND SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION OR EXCLUSIONS MAY NOT APPLY TO YOU.

8. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Regulatory Compliance Statements

Federal Communications Commission Radio Frequency Interference Statement

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. However, if this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

■ Reorient or relocate the receiving antenna.
■ Increase the separation between equipment and receiver.
■ Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
■ Consult the dealer or an experienced radio/television technician for help.
■ Use a shielded and properly grounded I/O cable and power cable to ensure compliance of this unit to the specified limits of the rules.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Adaptec, Inc.	ASR-2020ZCR/2120S/2200S/ AAR-2410SA/2810SA/21610SA
FC	Tested to Comply With FCC Standards
FOR HOME OR OFFICE USE	

European Union Compliance Statement

This Information Technology Equipment has been tested and found to comply with EMC Directive 89/336/EEC, as amended by 92/31/EEC and 93/68/EEC, in accordance with:

■ EN55022 (1998) Emissions

■ EN55024 (1998) Immunity:
   – EN61000-4-2 (1998) Electrostatic discharge: ±4 kV contact, ±8 kV air
   – EN61000-4-3 (1998) Radiated immunity
   – EN61000-4-4 (1995) Electrical fast transients/burst: ±1 kV AC, ±0.5 kV I/O
   – EN61000-4-5 (1995) Surges ±1 kV differential mode, ±2 kV common mode
   – EN61000-4-6 (1996) Conducted immunity: 3 V
   – EN61000-4-11 (1994) Supply dips and variation: 30% and 100%

In addition, all equipment requiring U.L. listing has been found to comply with EMC Directive 73/23/EEC as amended by 93/68/EEC in accordance with EN60950 with amendments A1, A2, A3, A4, A11.

Australian/New Zealand Compliance Statement

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to the Australian/New Zealand standard AS/NZS 3548 set out by the Spectrum Management Agency.

Canadian Compliance Statement

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Japanese Compliance (Voluntary Control Council Initiative)

This equipment complies to class B Information Technology equipment based on VCCI (Voluntary Control Council for Interface). This equipment is designed for home use but it may causes radio frequency interference problem if used too near to a television or radio. Please handle it correctly per this documentation.

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1

Introduction

In this Chapter...

Kit Contents

Your controller kit includes:

■ Adaptec RAID controller. For controller illustrations, see Appendix G.

■ Installation CD

■ The cables supplied depend on the controller model:

Adaptec Model	Cables Supplied
2020ZCR	None
2120S/2200S	1 internal LVD SCSI cable[1]
2410SA	4 SATA cables
2810SA	8 SATA cables
21610SA	16 SATA cables

1. Features a multimode terminator. All these SCSI RAID controllers support multimode termination.

■ Low-profile bracket for low-profile controllers only. To determine the form factor of your controller, see *Controller Features* on page 1-5.

■ Warranty card

■ Quick Installation Guide

Overview of the Installation Process

This section provides an overview of the process of installing, setting-up, and configuring the Adaptec RAID controller:

1 Install and configure the controller and hard drives, as described in Chapter 2, *Installing the Controller and Drives*.

2 Your next steps depend on your system:

In a system without an operating system (fresh install)...

a Build the bootable array, as described in *Creating a Bootable RAID 5 Array* on page 2-4.

b Install the controller driver at the beginning of the operating system installation, as described in Chapter 3.

c Install Adaptec Storage Manager as described in Chapter 4.

d View, manage, and build additional arrays, as needed, using Adaptec Storage Manager. For an overview, see Chapter 5. For details, refer to the Storage Manager online Help.

In an existing system that already has an operating system...

a Install the controller driver.

b Install Adaptec Storage Manager as described in Chapter 4.

c Build the array using Adaptec Storage Manager. View, manage, and build additional arrays, as needed, using Storage Manager. For an overview, see Chapter 5. For details, refer to the Storage Manager online Help.

3 Register online to receive important information about your controller at register.adaptec.com.

System Requirements and Compatibility

The following system requirements are discussed:

■ *Drive Requirements*

■ *System Requirements*

■ *Operating System Compatibility*

■ *Motherboard Compatibility*

Drive Requirements

You need to have enough drives available for the RAID array level you want to build. For details, see Appendix E, *About RAID*.

Note: Arrays work best when all array members (drives) are identical.

System Requirements

The following system features are required:

- Intel Pentium, or equivalent, processor
- At least 128 MB of RAM
- An available 32- or 64-bit PCI slot
- 20 MB of free drive space
- 16-bit SVGA color monitor with a resolution of at least 800 x 600
- CD-ROM drive (that is *not* part of the RAID you are installing)

Operating System Compatibility

The following operating systems are supported:

- Windows 2000—Server, Advanced Server, Professional
- Windows 2003 Server—Standard and Advanced
- Windows XP—Home Edition and Pro
- Red Hat Linux—Professional, Enterprise, and Advanced Server
- SuSE Linux—Personal, Professional, and Enterprise

  Note: For the latest on Adaptec's support of Linux, or to download driver sources, visit www.adaptec.com.

- SCO—
  - UnixWare 7.1.x/OpenUNIX 8 (Base and Business Editions)
  - OpenServer 5.06 and 5.07
- Novell—NetWare 6.*x*

Motherboard Compatibility

The Adaptec RAID controller requires a motherboard that meets the following compatibility requirements:

■ Complies with the *PCI Local Bus Specification, Revision 2.2* and higher.

■ Supports multifunction devices where one of the devices is a PCI bridge.

■ Provides large memory-mapped address ranges.

Refer to the Readme file on the Adaptec installation CD for additional motherboard compatibility information.

Controller Features

This section contains the following subsections:

■ *Features Overview*

■ *SATA RAID Controller Features Summary*

■ *SCSI RAID Controller Features Summary*

■ *Advanced RAID Features*

Features Overview

Adaptec RAID controllers offer the following features:

■ Supports *PCI Local Bus Specification*, Revision 2.2. Some models also support the *PCI-X Addendum*, Revision 1.0a. See pages 1-6 and 1-7.

■ 64-bit, 66-MHz PCI interface compatible with 32-bit/33-MHz PCI slots.

■ At least 64 MB of on-board RAM. Some controllers are available with more RAM.

■ *All except Adaptec 2020ZCR*—Optional battery backup module available. For details, see page 1-9.

■ Operating system independent configuration and RAID creation using the Adaptec RAID Configuration (ARC) utility.

■ Flash ROM for easy updates of controller firmware, BIOS, and ARC. For details on updating the flash, see Appendix C.

■ Event logging and broadcasting, including messaging for alphanumeric pagers.

■ Centralized management across all Adaptec host-based RAID products using Adaptec Storage Manager™. In addition to local console access, Adaptec Storage Manager provides remote configuration and management of RAID subsystems through password-protected Web access.

SATA RAID Controller Features Summary

The SATA RAID controller features are summarized in the table below:

	Adaptec 2410SA	Adaptec 2810SA	Adaptec 21610SA
Form factor	Low-profile	Full-height	Full-height
PCI compatibility	PCI only	PCI only	PCI only
PCI bus width (max)	64-bit	64-bit	64-bit
PCI bus speed (max)	66 MHz	66 MHz	66 MHz
Cache, standard	64 MB	64 MB	64 MB
Ports	4	8	16
Drives per port	1	1	1
Total drives	4	8	16
Connectors, internal	4	8	16
Cables supplied	4	8	16
RAID levels	0, 1, 5, 10	0, 1, 5, 10, 50	0, 1, 5, 10, 50
Simple volume	Yes	Yes	Yes
Spanned volume	Yes	Yes	Yes
Hotspares	Yes	Yes	Yes
Automatic failover	Yes	Yes	Yes
Audible alarm	Yes	Yes	Yes
Battery module option[1]	Not available	ABM-300	ABM-300

1. Battery sold separately.

SCSI RAID Controller Features Summary

The SCSI RAID controller features are described in the table below.

> **Note:** For more on SCSI, see Appendix F, *About SCSI*.

	Adaptec 2020ZCR	Adaptec 2120S	Adaptec 2200S
Form factor	Low-profile	Low-profile	Low-profile
PCI compatibility	PCI/PCI-X	PCI only	PCI only
PCI bus width (max)	64-bit	64-bit	64-bit
PCI bus speed (max)	133 MHz	66 MHz	66 MHz
Cache, standard	64 MB	64 MB	64 MB
Channels	None	1	2
Devices per channel[1]	15	15	15
Total devices	30	15	30
Connectors, internal[2]	None	1	2
Connectors, external[3]	None	1	2
Cables supplied	None	1 internal	1 internal
RAID levels	0, 1, 5, 10, 50	0, 1, 5, 10, 50	0, 1, 5, 10, 50
Simple volume	Yes	Yes	Yes
Spanned volume	Yes	Yes	Yes
Hotspares	Yes	Yes	Yes
Automatic failover	Yes	Yes	Yes
Audible alarm	Yes	Yes	Yes
Battery module option[4]	Not available	ABM-300	ABM-300

1. Includes Ultra320 through Ultra2 hard drives and other devices, including CD and tape drives.
2. High density
3. Very High Density Connector Interface (VHDCI)
4. Battery sold separately.

Advanced RAID Features

Adaptec RAID controllers support the following advanced features:

- **Optimized Disk Utilization**—Allows you to use the full capacity of all your drives, even if drive sizes vary.
- **SATA/SCSI Disk Hot Plug**—Allows you to add and remove disks without shutting down your system.
- *Online Capacity Expansion*
- *Array Level Migration*
- *Drive Enclosures – SCSI only*
- *Hotspares*
- *Audible Alarm*
- *Automatic Failover*
- *Adaptec Battery Backup Module*

Online Capacity Expansion

These Adaptec RAID controllers support Online Capacity Expansion (OCE) of existing arrays for all operating systems. With OCE, you can add new members to increase the capacity of an array without losing any data. For details, refer to the Adaptec Storage Manager online Help.

Windows OCE allows you to use the additional capacity without restarting the system. For details, refer to your Windows documentation.

Array Level Migration

Adaptec RAID controllers support migration from one array level, or type, to another provided your controller supports the new array type. The migration possibilities are described in the table below.

Current Array Type	New Array Type
RAID 0	RAID 5 or 10
RAID 1	RAID 0 or 5 or 10
RAID 5	RAID 0 or 10
RAID 10	RAID 0 or 5

For details, refer to the Adaptec Storage Manager online Help.

Drive Enclosures – *SCSI only*

Adaptec SCSI controllers support drive enclosures that include SAF-TE enclosure management hardware per the SAF-TE specification.

Hotspares

Adaptec RAID controllers support hotspares, drives that are reserved to replace a failing drive in a redundant array. In the event of drive failure, hotspares replace failed drives and arrays are automatically rebuilt.

The Adaptec RAID controllers support two types of hotspares:

■ **Global**—Protects every array that the drive has enough available capacity to protect.

■ **Dedicated**—Protects only the array that it has been assigned to protect.

Audible Alarm

Adaptec RAID controllers are equipped with an audible alarm that can alert you to situations that affect data safety. This section discusses the following topics:

■ *Sounding the Alarm*

■ *Silencing the Alarm*

For additional details on how to control the alarm, see and the Adaptec Storage Manager online Help.

Sounding the Alarm

The alarm sounds under the following circumstances:

■ When the controller is running, the alarm sounds when a drive fails. For example, if a drive becomes unplugged, the alarm sounds.

■ When restarting the system, the alarm sounds if an array is degraded. For example, if a drive is missing from a three-drive RAID 5, the alarms sounds.

■ If an array can't be configured, the alarm sounds. For example, if a drive is missing from a RAID 0, or if two drives are missing from a RAID-5, the alarm sounds.

Silencing the Alarm

The alarm continues to sound until one of the following actions is taken:

■ The array with the failed member is deleted.

■ If the array is redundant, a rebuild begins.

■ The alarm is silenced using SATA*Select* or SCSI*Select*. For details, see the Alarm Control option on page A-11 or Adaptec Storage Manager online Help.

Automatic Failover

Adaptec RAID controllers can automatically rebuild an array when a failed drive is replaced with a new drive. This feature applies only to redundant arrays in SES- or SAF-TE-enabled drive enclosures. See page A-10 for details.

Adaptec Battery Backup Module

Adaptec RAID controllers accept an optional Adaptec battery backup module.

✎ **Notes:**

■ To see if the controller is available with battery modules, see *Controller Features* on page 1-5.

■ To see the battery module connector location for your controller, see Appendix G.

■ To purchase a battery module, visit www.adaptec.com.

About the Documentation

The documentation set for the Adaptec RAID controllers includes:

■ **Quick Installation Guide**—Printed guide that provides the very minimum installation instructions necessary to install and create a bootable array.

■ **Readme text file**—Contains additional technical information about device compatibility, operating system support, and drivers. (For location, see table below.)

■ **Installation and User's Guide** (this book)—PDF file on the installation CD with complete information to configure and install your Adaptec RAID controller and attached devices. Includes a *Glossary*. (For location, see table below.)

■ **Command Line Interface Reference Guide**—PDF file on the installation CD containing an in-depth description of the commands available in the CLI. (For location, see table below.)

■ **Online Help**—Adaptec Storage Manager provides Help for creating and managing RAIDs, including embedded displays.

The locations for the PDF files and Readme file are listed below:

Document	CD Location
Readme	/
Installation and User's Guide	/books/RAID Install Gd 513853vAA.pdf
Command Line Interface Reference Guide	/books/RAID SW Ref 513852vAA.pdf

To view the PDF documents, you need Acrobat Reader or Viewer installed on your computer. For details, see *Installing the Adobe Acrobat Reader* on page 1-13.

For details on using the installation CD, see *Using the Adaptec Installation CD* on page 1-12.

Using the Adaptec Installation CD

The *Adaptec RAID Installation CD* contains array management software, device drivers, and documentation for the Adaptec RAID controller.

You can use the CD the following ways:

■ *Booting from the CD with No Operating System*

■ *Using the CD Autorun in Windows*

■ *Browsing the CD*

Booting from the CD with No Operating System

The Adaptec installation CD is bootable. You can use it to start a computer that has no operating system and configure an array, provided your computer recognizes bootable CDs.

> **Note:** Verify that your computer supports bootable CDs by entering system Setup and checking the settings.

Using the CD Autorun in Windows

To use the Autorun executable, autorun.exe, start Windows and insert the Adaptec installation CD. Your computer automatically reads the CD if it is set up to do so.

> **Note:** If your computer *does not* automatically read the CD, you can prompt it to read the CD by clicking on autorun.exe from the root directory.

The CD presents the following options:

■ **Install Adaptec Storage Manager**—Installs the management software. For details, see Chapter 4.

■ **Install Adobe Acrobat Reader**—Installs Adobe Acrobat Reader for Windows to let you view the Adaptec documentation in PDF format. Versions of Acrobat Reader for other platforms are also included, see *Installing the Adobe Acrobat Reader* on page 1-13.

■ **View Release Notes**—Displays the Readme file containing the latest information for Adaptec RAID products and software.

- **View Documentation**—Provides quick access to the PDF files listed in the table on .

- **Create Driver Diskette**—Allows you to create a driver disk for any supported operating system.

Browsing the CD

If your installation process requires you to directly access files on the Adaptec installation CD, you can save time by limiting your browsing to the following files and folders, available at the root level:

- **Autorun executable**—In Windows, click on **autorun.exe** if your computer does not automatically execute it when you insert the CD in the drive.

- **Readme text file**—Contains additional technical information about device compatibility, operating system support, and drivers.

- **DOCS folder**—Contains the user documentation PDF files.

- **PACKAGES folder (and subfolders)**—Contains the management software and device drivers.

- **SOURCES folder (and subfolders)**—Contains driver source files and other components developed under the GNU General Public License (GPL) agreement.

Installing the Adobe Acrobat Reader

Both Adobe Acrobat Reader and Viewer are provided on the Adaptec installation CD. These applications allow you to view the PDF files on the Adaptec installation CD. Acrobat Reader is also available from Adobe as a free download. For details, visit www.adobe.com.

How you use Reader or Viewer depends on your operating system, as described below:

- **Windows**—To install Acrobat Reader, choose the appropriate option. If Autorun is disabled, click **Autorun** on the root to enter.

- **Linux**—Acrobat Reader is located on the Adaptec installation CD at *mount-point/*packages/Linux/RedHat/apps/adobe. Be sure to use the full path when viewing this location. If the path gets truncated, you may not see the correct location.

■ **UNIX**—Use Acrobat Viewer because Reader is not available for all operating systems. Your system must have Java Runtime Environment 1.1.7B from April 11, 2000 or later. The Viewer is located on the installation CD at *mount-point*/Acrobat_Reader.

> ◪ **Note:** To download Java Virtual Machine (JVM), visit java.sun.com.

■ **NetWare**—Acrobat Reader and Viewer are not available for this operating system or any DOS environment. You need to use a computer that supports Acrobat Reader or Acrobat Viewer.

Software Tools Overview

The Adaptec RAID controller includes the following tools to configure and manage your storage devices:

■ **Adaptec Storage Manager**—Storage management application with a graphical user interface. Used to create, configure, and manage arrays. For details, see Chapters 4 and 5.

■ **Adaptec RAID Configuration (ARC) Utility**—BIOS-based utility that contains the following components:

   – **Array Configuration Utility (ACU)**—Storage management utility. Used to create, configure, and manage arrays. Also available as a DOS-based executable (see below). For details, see Appendix A.

   – **SATA*Select* and SCSI*Select***—Device management utility. Used to verify the hardware configuration of the controller and the drives. For details, see page A-9.

   – **Disk Utilities**—Drive management utility. Used to format and verify drives. For details, see page A-15.

■ **Array Configuration Utility (ACU) for DOS**—DOS utility. Used to create, configure, and manage arrays. Also available as part of the ARC utility (see above). For details, see Appendix B.

■ **Adaptec Flash Utility (AFU)**—DOS utility. Used to update, save, or verify the controller firmware, BIOS, and ARC versions. For details, see Appendix C.

■ **Command Line Interface (CLI)**—Allows you to automate array creation or testing in a production environment using scripts. For details, see Appendix D.

Safety Information

To ensure your personal safety, as well as the safety of you equipment:

■ Keep your work area and the computer clean and clear of debris.

■ Before opening the system cabinet, unplug the power cord.

Electrostatic Discharge

Electrostatic Discharge (ESD) is a natural by-product of human activity. ESD is produced by materials that accumulate and retain electrical charges which are transferred to people or other objects upon contact.

> ⚠ **Caution:** ESD can damage electronic components when they are improperly handled and can result in total or intermittent failures. Always follow ESD-prevention procedures when removing and replacing components.

To prevent ESD damage:

■ Use an ESD wrist or ankle strap and ensure that it makes skin contact. Connect the equipment end of the strap to an unpainted metal surface on the chassis. If a wrist strap is not available, ground yourself by touching the metal chassis before handling the controller or any other part of the computer.

■ Avoid touching the controller against your clothing. The wrist strap protects components from ESD voltages present on the body only. ESD voltages on clothing can still cause damage.

■ Handle your controller by its bracket or edges only. Avoid touching the printed circuit board or the connectors.

■ When you need to put your controller down, use an antistatic surface such as the bag supplied in your kit.

■ If you plan to return the controller to Adaptec, put it back in its antistatic bag immediately.

2

Installing the Controller and Drives

In this Chapter...

SATA Drives and Cables

To install an Adaptec SATA RAID controller and drives, you need equal numbers of each of the following:

■ Serial ATA hard drives

■ Serial ATA cables (supplied in this kit)

Configuration of Serial ATA drives is simple for the following reasons:

■ There are no jumpers or switches to set on SATA controllers or hard drives.

■ The cable connectors are identical, so you don't need to worry about which end to attach to the controller and which end to the drive.

■ All connectors are keyed so that you can insert them in only one direction.

SCSI Drives and Cables

Adaptec recommends using only the latest Ultra320 hard drives in arrays and only high-quality Ultra320-rated cables with multimode terminators for all drives that share a channel with Ultra320 drives.

Notes:

■ For additional considerations related to installing SCSI drives, see Appendix F, *About SCSI*.

■ Use only good quality cables. Poor quality cables may degrade system reliability. Avoid cables not rated for Ultra320 operation.

■ To buy cables, visit www.adaptec.com.

■ Use device adapters as needed to connect any SE drives.

■ *Do not* attach a cable to the controller unless the other end of the cable is attached to a least one drive. Doing so would cause unstable operation.

Installing the Controller and Drives

To install Adaptec RAID controller and drives:

1 If you have a low-profile controller and a low-profile computer cabinet, replace the original full-height bracket with the low-profile bracket supplied in Adaptec RAID controller kit. To verify the form factor of your controller model, see *Controller Features* on page 1-5.

2 Turn off your computer.

3 Ground yourself by touching the system chassis.

4 Unplug the power cord.

5 Open the system cabinet.

6 Select an available PCI slot as follows:

– *Adaptec 2020ZCR*—Use only a 3.3-V, ZCR-enabled slot.

– *All other adapters*—Use any PCI slot. You'll get better performance if you use a 64-bit slot.

7 Remove the slot cover from an available PCI bus slot.

8 Install the controller in the PCI slot and secure the controller bracket to the chassis.

9 Connect the computer's disk activity LED cable to the appropriate connector on the controller. See Appendix G for the location of this connector for your controller.

Ensure that the positive lead of the LED cable, usually a red wire or a wire marked with a red stripe, is attached to pin 1 and the negative lead, usually a black wire, is attached to pin 2.

10 Install and connect any internal drives using the appropriate cable.

> **Note:** If you are intending to build a RAID 5 as described in *Creating a Bootable RAID 5 Array* on page 2-4, install at least three drives.

11 Close the computer cabinet.

12 *SCSI controllers only*—Connect any external cables and drives to the Adaptec SCSI RAID controller.

Determining the Boot Controller

> **Note:** If your system will contain two or more bootable controllers, read this section. Otherwise, skip this section.

The Adaptec RAID controller supports bootable drives and arrays. The default setting of the controller and system Setup usually allows you to install and boot from either a hard drive connected to the motherboard, or from a drive or array connected to the controller.

If you already have an operating system installed on a hard drive connected to the motherboard and you want to boot a second operating system from the RAID controller:

1 Enter the system Setup.

2 Navigate to the hard drive boot sequence.

3 Move the boot controller to the top of the list.

Creating a Bootable RAID 5 Array

> **Note:** If you want to install an operating system on a drive or array connected to your Adaptec RAID controller, read this section. Otherwise, skip to installing the driver in your existing operating system, as described in Chapter 3.

This section describes how to create a bootable RAID 5 array with at least three drives.

The following methods are described. Choose the method you prefer:

■ *Using the Adaptec RAID Configuration (ARC) Utility*—Use this method if you prefer a text-based approach.

■ *Using the Adaptec Installation CD*—Use this method if you prefer a graphical interface-based approach.

Why build a RAID 5?

This array level is supported by your controller. It provides a versatile combination of performance and redundancy on a minimum of three drives. Because RAID 5 uses parity, it is the safest, and most recoverable, of all RAID levels.

What if I prefer a different array level?

That's no problem. Once you build your array and install your operating system, you can change array levels (see *Array Level Migration* on page 1-8) or expand the capacity of the array (see *Online Capacity Expansion* on page 1-8) to suit your needs.

Using the Adaptec RAID Configuration (ARC) Utility

To build a bootable RAID 5 array using ARC:

1   Install the controller and drives, as described in *Installing the Controller and Drives* on page 2-3.

> **Note:** For a RAID 5, you need at least 3 drives.

2   Turn on the computer, then press **Ctrl-A** to enter the ARC utility.

The first screen shows all installed Adaptec RAID controllers.

3   If more than one Adaptec RAID controller is installed, highlight the boot controller, then press **Enter**.

4   To select the ACU utility, press **Enter**.

The ACU screen appears.

5   Using the arrow keys, highlight **Initialize Drives**, then press Enter.

6   Press **Insert** to highlight the drives you want to initialize, then press **Enter** to start the initialization process.

7   Using the arrow keys, highlight at least three drives to be used for the array and press **Insert** for each highlighted drive.

The utility displays the selected drives.

8   Press **Enter**.

A red warning box appears—this is normal.

9 Press **Y**, then **Enter**.

The selected drives are initialized, then the ACU screen is displayed.

10 Using the arrow keys, highlight **Create Array**, then press **Enter**.

11 Using the arrow keys as in Step 7, highlight at least three drives to be used in the array and press **Insert** for each highlighted drive.

12 Press **Enter**.

13 On the next screen, respond as follows:

Property Line Displayed	Entry or Selection
Array Type	Select RAID 5, then press **Enter**
Array Label	Type a name, then press **Enter**.
Array Size	Press **Enter**, then press **Enter** again to use the default granularity of GB.
Stripe Size	Press **Enter**.
Read Caching	Press **Enter**.
Write Caching	Press **Enter**.
Create RAID via	Press **Enter**.
[Done]	Press **Enter**.

A Creating Array window appears.

14 Press **Enter** to continue with the array configuration.

Note: You can start using the array immediately. However, performance is reduced until the build process is complete.

15 Press **Esc** until the Exit Utility window appears.

16 Highlight **Yes**, then press **Enter**.

The system restarts.

17 Install the driver as described in Chapter 3.

Using the Adaptec Installation CD

> **Note:** *SCSI only*—You cannot create the RAID using a CD drive connected to the RAID controller.

To build a bootable RAID 5 array using the Adaptec installation CD:

1 Install the controller and drives, as described in *Installing the Controller and Drives* on page 2-3.

2 Start or restart the computer.

3 Insert the Adaptec installation CD.

> **Note:** If the installation CD does not start automatically, you may need to enter system Setup and enable booting from the CD. For details, refer to your computer's documentation.

4 Select the appropriate language on the Language screen, then press **Enter**. Read the information on the Licenses screen, then press **Enter** again.

The Adaptec installation CD main menu is displayed.

5 Select the option **Launch Configuration Utility**.

The system launches Adaptec Storage Manager. The Storage Manager screen appears.

6 Click **Create**.

7 In the configuration wizard, select **Custom**.

8 Click the **RAID 5** button, then click **Next**.

9 Click at least three drives to be used in your array.

Each drive you select is marked with a check.

10 Click **Next**.

11 Type the name you want to assign to the RAID 5 you are creating, then click **Apply**.

The system creates the array. The display refreshes to show the just-created RAID 5 on the right side of the display. You may use the array immediately. However, if you want to make the array bootable you must allow the array to finish building before restarting the system.

12 When you are ready to continue, close all windows.

The Main Menu is active.

13 Click **Reboot** to restart your system.

14 Remove the Adaptec installation CD.

15 If you want to make the array bootable, do so now. For details, see page A-5.

3

Installing the Driver

In this Chapter...

Overview of the Driver Installation Process

Adaptec recommends the following driver installation procedure:

1 Create a driver disk. See *Creating the Driver Disk* on page 3-2 for details.

2 Identify the appropriate installation procedure for your computer.

You need to know the operating system and whether you are installing the driver while also installing the operating system, or installing the drive onto a system that already has the operating system installed.

3 Familiarize yourself with the supported RAID types. You will need to select a RAID type during your driver installation. See Appendix E for details.

> **Note:** If you don't like your initial RAID level selection, you can change it later using *Array Level Migration*. For details, see page 1-8 and the Adaptec Storage Manager online Help for details.

4 Read and understand the entire installation procedure.

5 Proceed with the installation.

Creating the Driver Disk

> **Note:** If you are adding the controller to a Linux system that was already installed, you do not need to create a driver disk; skip this section.

Before installing the driver, create the driver disk:

1 Set your system BIOS so that your computer boots from the CD-ROM drive.

2 Insert the Adaptec installation CD and turn on the computer.

3 Respond to the on-screen instructions as necessary to get to the Adaptec Start Menu.

4 Click **Create Driver Disk**, then select the appropriate operating system.

5 *If you selected Linux*, you need to also select the architecture, one of the following:
  – **i386**—For Intel 386 or 486 computers
  – **i586**—For Pentium I or II computers
  – **i686**—For Pentium III, IV, or AMD K-6 computers
  – **Athlon**—AMD Athlon computers

6 Select the appropriate floppy drive letter, then choose the appropriate format. You need a full format only if the disk has never been formatted or may have bad sectors.

7 Insert a floppy disk, then click **OK**. The system creates the driver disk.

8 Remove and label the driver disk.

Now that you have created your driver disk, identify the appropriate driver installation procedure and proceed with the installation.

Installing the Windows Driver

This section contains the following procedures:

■ *Installing the Driver When You Install Windows*

■ *Installing the Driver in an Existing Windows System*

Installing the Driver When You Install Windows

To install the driver with the operating system during a fresh install:

1 Install and configure the controller and hard drives, as described in page 2-3.

2 Create the bootable array, as described on page 2-4.

3 Create the driver disk, as described on page 3-2. When finished, remove the driver disk.

4 Insert the Windows setup CD and restart the computer to begin the Windows installation.

5 When prompted to install a third-party driver, press **F6**.

> **Note:** When F6 is active, a prompt appears at the bottom of the screen for only 5 seconds. If you miss your chance to press F6, restart the computer.

6 Insert the driver floppy disk and wait until prompted to install a driver. Press **S** to specify that the driver is on the floppy disk, then press **Enter**. The computer reads the disk.

7 When the Adaptec driver is found, press **Enter**. Respond to the on-screen instructions to complete the installation.

Installing the Driver in an Existing Windows System

To install the driver in an existing operating system:

1 Install and configure the controller and hard drives, as described in Chapter 2.

2 Create the driver disk, as described on page 3-2. When finished, remove the driver disk.

3 Start Windows. Windows launches the Found New Hardware Wizard, which searches for the driver.

4 Insert the driver floppy disk, select the floppy drive as the source, then click **Next**.

5 Click **Next** in the two subsequent windows and follow the on-screen instructions to complete the driver installation.

6 Remove the driver disk and restart the computer.

Installing the Linux Module

This section contains the following procedures:

■ *Installing the Module When You Install Red Hat*

■ *Installing the Module in an Existing Linux System*

> **Notes:**
>
> ■ *SuSE Linux only*—The controller is not supported as a bootable controller. In other words, you can only use *Installing the Module in an Existing Linux System* on page 3-6.
>
> ■ For the most up-to-date information on Adaptec's support of Linux, visit www.adaptec.com.

Installing the Module When You Install Red Hat

To install the module with the operating system during a fresh install:

1 Install and configure the controller and hard drives, as described in page 2-3.

2 Create the bootable array, as described on page 2-4.

3 Create the driver disk, as described on page 3-2. When finished, remove the driver disk.

4 Insert the first Red Hat installation CD and restart the computer to begin the operating system installation.

5 Restart the computer.

6 When the Red Hat Welcome screen appears, type expert at the Boot: prompt.

7 When prompted, insert the driver disk, then select **OK**.

8 Follow the prompts to set up your preferred environment.

9 If you are installing other third-party devices, proceed with the installation of those devices. Otherwise, select **Done**.

10 Proceed with the Linux installation according to the Red Hat instructions.

Installing the Module in an Existing Linux System

To install the module in an existing Red Hat or SuSE Linux system:

1 Insert and mount the Adaptec installation CD.

2 Install the module RPM by typing:

```
rpm -Uvh mount-point/linux/arc/driver/aac1.1.4-2322.rpm
```

3 Run fdisk, mkfs, and create mount points for any new drives.

Installing the Unix Driver

This section discusses the following systems:

■ *OpenServer*

■ *UnixWare and OpenUNIX*

OpenServer

This section contains procedures for installing the driver in OpenServer systems.

Installing the Driver When You Install OpenServer

To install the driver with the operating system during a fresh install:

1 Install and configure the controller and hard drives, as described in page 2-3.

2 Create the bootable array, as described on page 2-4.

3 Create the driver disk, as described on page 3-2. When finished, remove the driver disk.

4 Insert the OpenServer installation CD and restart the computer.

The system starts loading from the CD and displays a Boot: prompt.

5 When you see the Boot: prompt, insert the driver disk and type defbootstr link=aacraid.

6 Follow the OpenServer instructions to complete the installation.

7 When the installation is complete, remove the driver disk and restart the computer.

8 Insert and mount the Adaptec installation CD.

9 To enable RAID management software and utilities, type the following commands:

```
cd mount-point/openserv/arc/driver/aacraid/reloc/tmp/aacraid/scripts
cp ./aacaifd /usr/sbin
cp ./S98aacaifd /etc/rc2.d
chmod 755 /usr/sbin/aacaifd /etc/rc.d/S98aacaifd
```

Installing the Driver in an Existing OpenServer System

To install the driver in an existing operating system:

1 Install and configure your Adaptec RAID controller and hard drives, as described in Chapter 2.

2 Create the driver disk, as described on page 3-2. When finished, remove the driver disk.

3 Boot the server.

4 Insert the driver floppy disk.

5 To run the installpkg utility, open a terminal window and type the `installpkg` command.

   OpenServer reads the disk and performs the installation.

6 Rebuild the kernel.

7 Install the new kernel by typing `y` when prompted to make it the default kernel.

8 Restart the computer.

9 Add devices created on the RAID controller to the operating system. For details, refer to your OpenServer documentation.

10 Insert and mount the Adaptec installation CD.

11 To enable RAID management software and utilities, type the following commands:

```
cd mount-point/openserv/arc/driver/aacraid/reloc/tmp/aacraid/scripts
cp ./aacaifd /usr/sbin
cp ./S98aacaifd /etc/rc2.d
chmod 755 /usr/sbin/aacaifd /etc/rc.d/S98aacaifd
```

UnixWare and OpenUNIX

This section contains the following procedures:

■ *Installing the Driver When You Install UnixWare or OpenUNIX*

■ *Installing the Driver in an Existing UnixWare or OpenUNIX System*

✓ **Note:** Although the driver disk you create for UnixWare and OpenUNIX differ, the installation procedures for these operating systems are the same.

Installing the Driver When You Install UnixWare or OpenUNIX

To install the driver with the operating system during a fresh install:

1 Install and configure the controller and hard drives, as described in page 2-3.

2 Create the bootable array, as described on page 2-4.

3 Create the driver disk, as described on page 3-2. When finished, remove the driver disk.

4 Insert the Unix installation CD and start the operating system installation.

5 When you see the prompt, Choose One, insert the driver disk, select **Install HBA diskette**, and then press **F10**.

The computer loads the driver from the driver disk, then the HBA screen is displayed.

6 Select **Proceed with Installation**, then press **F10**.

7 Complete the installation as appropriate.

8 When the installation is finished, remove the driver disk and restart the computer.

Installing the Driver in an Existing UnixWare or OpenUNIX System

To install the driver in an existing operating system:

1 Shut down the computer. Install and configure the controller and hard drives, as described in Chapter 2.

2 Create the driver disk, as described on page 3-2. When finished, remove the driver disk.

3 Turn on the computer, then insert the driver disk.

4 To run the pkgadd utility, type `pkgadd -d diskette1` and then press **Enter**. UNIX reads the disk and package information.

5 Press **Enter**.

6 Restart the computer. The system rebuilds the kernel automatically.

7 Add devices created on the RAID controller to the operating system. For details, refer to your OpenServer documentation.

Installing the NetWare Driver

This section contains the following procedures:

■ *Installing the Driver When You Install NetWare* on page 3-10

■ *Installing the Driver in an Existing NetWare System* on page 3-11

■ *Loading NetWare Drivers During Server Restart* on page 3-12

Installing the Driver When You Install NetWare

To install the driver with the operating system during a fresh install:

1 Install and configure the controller and hard drives, as described in page 2-3.

2 Create the bootable array, as described on page 2-4.

3 Create the driver disk, as described on page 3-2. When finished, remove the driver disk.

4 Restart the computer, then press **Ctrl+A** when prompted to access the ARC utility. Use ARC to create the RAID. For details, see *Using the Adaptec RAID Configuration (ARC) Utility* on page 2-5.

5 Install and configure a secondary controller, if any.

6 Create the driver disk, as described on page 3-2. When finished, remove the driver disk.

7 Install the operating system according to the NetWare documentation. Verify that you have the aacraid.ham and aacraid.ddi files available on the driver disk created at the beginning of this chapter.

8 When the Device Types screen appears, check the **Storage adapters** list and select **Modify** to add another driver.

9 Select **Storage adapters**, then press **Enter**.

All recognized controllers are displayed.

10 If AACRAID is detected, delete it.

11 Press **Insert** to add another driver. The available drivers are displayed.

12 Insert the driver floppy disk.

13 Press the **Enter** key to scan the floppy drive.

Once the driver is selected, the parameter screen is displayed.

14 Verify the loaded drivers. From the lower window menu, select **Continue**, then press **Enter**.

> **Note:** If the driver installation process fails, the server console is displayed so you can see the cause of the failure.

Now that you have installed the drivers, refer to your NetWare documentation to modify disk partitions, apply hot fixes, or perform volume maintenance. Also see *Loading NetWare Drivers During Server Restart* on page 3-12 for a summary of array management options in NetWare.

Installing the Driver in an Existing NetWare System

To install the driver in an existing operating system:

1 Upgrade your NetWare server to the minimum patch level specified by Novell.

2 Make a backup copy of the driver.

3 Create the driver disk, as described on page 3-2. When finished, remove the driver disk.

4 Shutdown the server.

5 Install and configure the Adaptec RAID controller as a secondary controller, as described in Chapter 2.

6 Start the server.

7 At the NetWare server console prompt, type load nwconfig.nlm and press **Enter**.

8 Select **Driver Options** and press **Enter**.

9 Select **Configure disk and storage device drivers** and press **Enter**.

10 Select **Select an additional driver** and press **Enter**.

11 Insert the driver floppy disk, then press the **Insert** key.

All available drivers are displayed.

12 Press the **Insert** key again to access additional drivers.

13 Press **Enter** to scan for the drivers.

14 Select **Adaptec AdvancedRAID Controller** and press **Enter**.

The aacraid parameters screen is displayed.

15 Select **Select/Modify driver Parameters** and press **Enter**.

16 Select **Save parameters and load driver**.

17 When prompted to select an additional driver, select **No**.

18 Press **Esc** to exit the Nwconfig utility.

19 Create any arrays using the ARC utility (see *Using the ACU* on page A-2) or remotely using Adaptec Storage Manager (refer the online Help). Alternatively, you can create arrays using the Command Line Interface (CLI). Refer to the *Adaptec Command Line Interface Reference Guide*.

Now that you have installed the drivers, refer to your NetWare documentation to modify disk partitions, apply hot fixes, or perform volume maintenance. See also *Loading NetWare Drivers During Server Restart*.

Loading NetWare Drivers During Server Restart

To automatically load the aacraid.ham driver during server restart, the startup.ncf file (usually located in your server's startup directory) must contain a load command line that specifies the location of the driver and any appropriate command line options.

The syntax to load the driver is:

```
load [pathname]aacraid.ham slot=number [options]
```

For example, the command to load the driver from the c:\nwserver directory, with the **verbose=** option ON is:

```
load c:\nwserver\aacraid.ham slot=2 verbose=y
```

Notes:

■ Command line options are *not* case sensitive.

■ Placing commas between command line options is optional.

To modify the startup.ncf file:

1   At the server console prompt, type `load nwconfig` and press **Enter**.

2   Select the **NCF File Options** menu, then press **Enter**.

3   Select the **Modify Startup.ncf** option, then press **Enter**.

4   Make the necessary changes. When you are done, press **Esc**.

> **Note:** You can also use your DOS text editor to modify the startup.ncf file, it resides on the DOS partition.

For additional information on the startup.ncf file, refer to your NetWare documentation.

4

Installing and Starting Adaptec Storage Manager

In this Chapter...

After you have installed your Adaptec RAID controller and driver, you are ready to install and use Adaptec Storage Manager—a user-friendly graphical user interface that makes it easy for you to create and manage arrays without having to restart the computer and use the BIOS utility.

Note: You need administrator or root privileges to install Storage Manager. For details on verifying privileges, refer to your operating system documentation.

Installing Storage Manager on Windows

This section provides instructions for installing Storage Manager.

> **Note:** On Windows, Storage Manager supports up to 16 Adaptec RAID controllers.

To install Storage Manager:

1 Insert the Adaptec installation CD and wait for the Autorun executable to start the installation. If this does not occur, browse the CD and click **Autorun**.

2 When the installation wizard starts, follow the instructions on the screen to complete the installation.

> **Note:** When prompted to install SNMP (Simple Network Management Protocol), accept the default (*do not install*) unless you have a specific requirement for Storage Manager to work with SNMP gets and traps.

Installing Storage Manager on Linux

✓ Notes:

- With Linux, Storage Manager supports up to 12 Adaptec RAID controllers.

- Storage Manager includes the Java Runtime Environment (JRE).

- If a previous version of Storage Manager is already installed and you are upgrading, you must first remove that version. Any customization files you may have created when you used the previous version are saved and used in the upgrade. To remove Storage Manager, type the `rpm --erase StorMan` command.

- For the latest on Adaptec's support of Linux, visit www.adaptec.com.

To install Storage Manager:

1 Insert the Adaptec installation CD.

2 Mount the Adaptec installation CD:

for Red Hat   `mount /dev/cdrom /mnt/cdrom`

for SuSE   `mount /dev/cdrom /media/cdrom`

3 Change to the cdrom directory:

for Red Hat   `cd /mnt/cdrom/linux/manager`

for SuSE   `cd /media/cdrom/linux/manager`

4 Extract the RPM package and install it:

`rpm --install ./StorMan*.rpm`

5 Unmount the Adaptec installation CD:

for Red Hat   `umount /mnt/cdrom`

for SuSE   `umount /media/cdrom`

Installing Storage Manager on OpenServer

✓ Notes:

- With OpenServer, Storage Manager supports up to 12 Adaptec RAID controllers.

- You need either the Java Development Kit (JDK) for SCO or the Java Runtime Environment (JRE) for SCO, version 1.3.1. To download these, visit www.thescogroup.com.

- *OpenServer 5.06 only*—Requires the following packages: urwfonts and package set OSR-compatible Version 8.0.1 or higher, both available on the maintenance CD; OSS643A for socket driver supplement from the www.thescogroup.com. Release Supplement 5.06a is helpful but not required.

- If a previous version of Storage Manager is already installed and you are upgrading, you must first remove that version. Any customization files you may have created when you used the previous version are saved and used in the upgrade. To remove Storage Manager, type `pkgrm RaidMan`.

To install Storage Manager:

1 Insert the Adaptec installation CD.

2 Mount the Adaptec installation CD:

```
mount -r -f HS,lower /dev/cd0 /mnt
```

3 Install using `pkgadd`:

```
pkgadd -a /mnt/openserv/manager/RaidMan.adm -d /mnt/
    openserv/manager/RaidMan.ds
```

4 Follow the instructions on the screen to complete the installation. When the installation is complete, change to the root directory:

```
cd /
```

5 Unmount the CD-ROM drive:

```
umount /mnt
```

6 To start RAID Agent, type the following case-sensitive command:

```
sh /opt/RaidMan/RaidAgnt.sh
```

When successful, a copyright message is displayed in the terminal window.

If you want RAID Agent to run at startup all the time, add the following line to the /etc/inittab and /etc/conf/init.d/kernel files:

```
nfra:12346:once:sh /opt/RaidMan/RaidAgnt.sh
```

Installing Storage Manager on UnixWare & OpenUNIX

Notes:

■ With UnixWare and OpenUNIX, Storage Manager supports up to 12 Adaptec RAID controllers.

■ You need root privileges to install Storage Manager.

■ You need either the Java Development Kit (JDK) for SCO or the Java Runtime Environment (JRE) for SCO, version 1.3.1. To download these, visit www.thescogroup.com.

■ If a previous version of Storage Manager is already installed and you are upgrading, you must first remove that version. Any customization files you may have created when you used the previous version are saved and used in the upgrade. To remove Storage Manager, type the pkgrm RaidMan command.

To install Storage Manager:

1 Insert the Adaptec installation CD.

2 Mount the Adaptec installation CD:

```
mount -r -F cdfs /dev/cdrom/cdromdevicefile /mnt
```

where cdromdevicefile is the device file, for example, c0b0t0l0, for the CD-ROM block device. To determine the actual filename, look in the /dev/cdrom directory.

3 Use pkgadd to install Storage Manager:

```
pkgadd -d /mnt/unixware/manager/RaidMan.ds
```

4 Follow the instructions on the screen to complete the installation.

5 Unmount the CD-ROM drive:

```
umount /mnt
```

6 *UnixWare Only*—To start RAID Agent, type the following case-sensitive command:

```
sh /opt/RaidMan/RaidAgnt.sh
```

When successful, a copyright message is displayed in the terminal window.

If you want RAID Agent to run at startup all the time, add the following line to the /etc/inittab and /etc/conf/init.d/kernel files:

```
nfra:12346:once:sh /opt/RaidMan/RaidAgnt.sh
```

Installing Storage Manager on NetWare

Notes:

- With NetWare, Storage Manager supports up to 16 Adaptec RAID controllers.
- You need the latest Support Pack for your operating system so you can run the supported Java Virtual Machine (JVM).
- You need JVM version 1.3 or later. To check your JVM version, load JVM, type JAVA -VERSION.
- For the latest updates from Novell, visit www.novell.com.

To install Storage Manager:

1 Insert the Adaptec installation CD.

2 From the command prompt, type load cdrom and press **Enter**.

3 From the command prompt, type:

```
RaidMan:\netware\manager\install
```

The installation program starts.

4 Follow the instructions on the screen to complete the installation.

Starting Storage Manager

> **Note:** You need root privileges to run Storage Manager.

To start Storage Manager, use the procedure outlined in the table below for your operating system.

If your operating system is...	Start Storage Manager as follows...
Windows	To run Storage Manager as a standalone application, click **Start > Programs > Adaptec Storage Manager**, then select the appropriate icon. To run Storage Manager in a browser, open the browser, then type in the IP address, colon (:), and `34572` as the port number.[1]
Linux	Change to the directory where you installed Storage Manager by typing `cd /usr/RaidMan`. Then, use the `sh RaidMan.sh` shell command.
OpenServer UnixWare OpenUNIX	Change to the directory where you installed Storage Manager by typing `cd /opt/RaidMan`. Then, use the `sh RaidMan.sh` shell command.
NetWare	Type the `LOAD RAIDMAN` command.
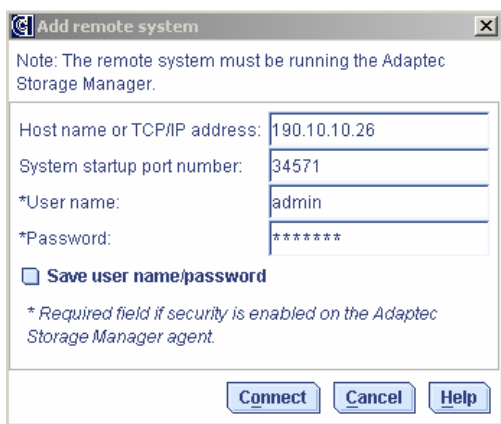
1. To run Storage Manager in a browser, your network's DNS configuration must have matching forward and reverse lookups.

Logging into Remote Systems

To log into a remote system:

1 Click **Remote** > **Add Remote System**.

Storage Manager displays the login screen, as shown below.

2 Type the IP address.

The default System startup port number, 34571, is supplied for you.

3 For Username, type admin

4 For Password, type adaptec

Note: The username and password are case sensitive.

Once you are logged in for the first time, you can add new accounts and change account passwords. For details, refer to the online Help.

5

Understanding Adaptec Storage Manager

In this Chapter...

Introduction

This chapter provides an overview of Adaptec Storage Manager, the user-friendly graphical user interface that you use to easily create and manage arrays. For more details on using Adaptec Storage Manager to set up and manage arrays, refer to the online Help.

Overview

Adaptec Storage Manager provides an expandable tree view of the systems and controllers you are managing. You can perform most configuration and management tasks by selecting a controller from the tree and working with related objects. The figure below shows how Adaptec Storage Manager displays information about Physical and Logical devices.

Using the buttons in the Physical devices and Logical devices views, you can:

- Change how drives are displayed.

- Collapse and expand a view.

- Identify components of a logical device.

- Create and delete hotspares.

Physical Devices View

This view displays information about the drives, enclosures, and other physical devices attached to the controller. The devices are organized numerically. The display for each channel or port includes information on maximum speed, the number of the channels on the controller, and the number of devices attached to the controller.

Indicators, next to the controller name, report status of the fan and temperature modules on SAF-TE (enclosure management) devices and other devices that monitor these conditions. The indicator colors are:

- **Blue**—Normal
- **Yellow**—Warning
- **Red**—Error
- **Gray**—Not applicable to the devices.

For example, the fan indicator changes to yellow when one fan fails; it changes to red when a second fan fails and cooling is no longer adequate.

Logical Devices View

This view displays information about the logical devices created using the physical devices, including the number of logical devices, the RAID level of each device, and whether a logical device is protected by a hotspare.

You can create and delete logical devices in the Logical devices view by selecting the **Create** option and using the Create wizard.

Changing How Drives are Displayed

You can choose how information is displayed in the Physical devices view by clicking one of the following buttons in the Logical devices view.

T	Displays physical device information in text format. This is the default view.
	Displays physical device information in full size capacity format. A full-length bar is displayed for each drive, regardless of capacity. A small segment on each drive is reserved for the *RAID signature*; this area is indicated by a gray *cap* at the end of each bar. **Note:** A drive shaded in light blue is not part of any disk group.
	Displays physical device information in relative size capacity format. A full-length bar is displayed for the largest drive; proportionally shorter bars are displayed for other drives.

Collapsed and Expanded Views

You can display a collapsed or expanded view of the system configuration. Initially, Storage Manager displays a collapsed textual view of the configuration information in both the Logical devices and Physical devices views.

In the Logical devices view...
Click to expand and collapse information about disk groups and logical devices. The expanded display shows the following information about each logical device:

- Disk group name and capacity (if available)
- Logical device size
- Logical device state
- Build progress

In the Physical devices view...
Click to expand and collapse information about physical drives. The expanded display shows the following information about each drive:

- Capacity of the drive
- Drive ID
- Drive state

Component Views

When you click a physical or logical device in the device views, the related components are highlighted in the other view.

■ When you click a logical device in the Logical devices view, the physical drives that make up the logical device are highlighted in the Physical devices view, and vice-versa.
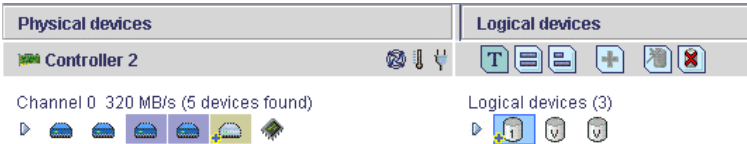
■ When you click a hotspare, the logical devices protected by that spare are highlighted.

■ In the graphical views, if the logical device uses only part of the available storage, only those segments are highlighted (in dark blue).

A
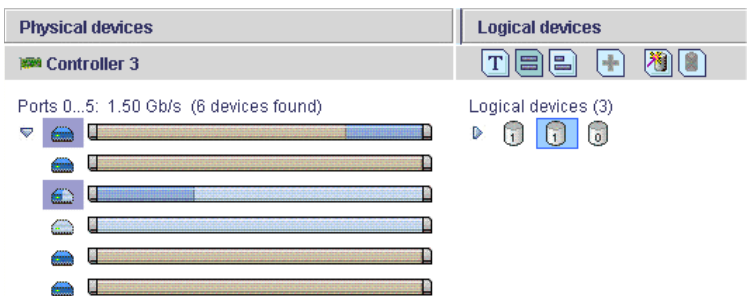
Adaptec RAID Configuration Utility (ARC)

In this Appendix...

Overview

The Adaptec RAID Configuration (ARC) utility is part of the controller BIOS. The utility includes:

■ **Array Configuration Utility (ACU)**—Used to create, configure, and manage arrays, and make arrays bootable. Also used to initialize and rescan drives. (Also available as a stand-alone DOS utility as described in Appendix B, *ACU for DOS*.)

■ **SATA*Select* and SCSI*Select***—Used to change device and controller settings.

■ **Disk Utilities**—Used to format or verify media.

To run the ARC utility, press **Ctrl+A** when prompted by the following message during system startup:

Press <Ctrl><A> for Adaptec RAID Configuration Utility

The Adaptec RAID Controller menu presents the following options:

■ Array Configuration Utility

■ SATA*Select* and SCSI*Select* Utilities

■ Disk Utilities

To select a menu option in ARC, browse with the arrow keys, then press **Enter**. Sometimes, selecting an option displays another menu; to return to the previous menu at any time, press **Esc**.

The following sections discuss each of these menu options.

Using the ACU

The Array Configuration Utility (ACU) allows you to perform the following tasks:

■ *Creating Arrays*

■ *Managing Arrays*

■ *Initializing Drives*

■ *Rescanning Drives*

Creating Arrays

To create an array:

1 *For systems with RAID enclosures*—Power up any enclosures.

> **Note:** The ACU may not find disks or enclosures that were powered up after system power-up. Therefore, power up enclosures prior to powering up the computer.

2 Shut down and restart the computer.

> **Note:** After you install a controller in a system and start it for the first time, the BIOS may display a configuration that does not match your system's configuration. This is normal. Proceed with array creation.

3 Press **Ctrl+A** when prompted to access the ARC utility.

4 From the ARC menu, select **Array Configuration Utility**.

5 From the ACU menu, select **Create Array**.

6 Browse with the arrow keys to select a channel.

7 Select the disks for the new array, then press **Insert**. To deselect a disk, highlight the disk, then press **Delete**.

ACU displays the largest usable space available for each disk. You can use available space from multiple disks for the new array.

> **Note:** Disks containing MS-DOS partitions, disks with no usable space, or disks that are not initialized appear dimmed and cannot be used in a new array. For information on how to initialize a drive, see page A-7.

8 When you are finished selecting disks, press **Enter**.

The Array Properties menu is displayed.

Assigning Array Properties

> **Note:** The ACU can be used to assign array properties only prior to building the array. After the array is built, you need to use Adaptec Storage Manager to assign properties.

To assign properties to the new array:

1 In the Array Properties menu, select an array type, then press **Enter**.

The display shows only the array types available for the number of drives selected. The supported array types (RAID levels) for your controller are listed in *Controller Features* on page 1-5.

The maximum number of drives allowed and minimum number of drives required depends on the RAID level. For details, see Appendix E, *About RAID*.

2 Type an optional label for the array, then press **Enter**.

3   Enter the desired array size.

The maximum array size available based on the partitions you selected is displayed automatically. If you want to designate a different array size, type the desired array size and select **MB** (megabytes), **GB** (gigabytes), or **TB** (terabytes) from the drop-down list. If the available space from the selected partitions is greater than the size you specify, the remaining space is available for use in other arrays.

4   Select the desired stripe size.

The allowable stripe sizes are 16, 32, and *64* KB (the default). The default stripe size provides the best overall performance in most network environments.

5   Specify whether you want to enable read and write caching for the array.

⚠️   **Caution:** When caching is *Enabled*, there is a potential for data loss or corruption during a power failure.

Caching should usually be enabled to optimize performance, unless your data is highly sensitive, or unless your application performs completely random reads, which is unlikely.

6   When you are finished, select **Done**.

The array build starts.

Managing Arrays

With the Manage Arrays option, you can perform the following tasks:

■   *Viewing Array Properties*

■   *Making an Array Bootable*

■   *Deleting Arrays*

■   *Managing Failover Drive Assignments*

Viewing Array Properties

To view the properties of an existing array:

1   From the ACU main menu, select **Manage Arrays**.

2   From the List of Arrays dialog box, select the array you want to view, then press **Enter**.

   To view properties related to the array's physical disks:

   – **RAID 0, 1, 5 (Single-Level Arrays)**—View the Array Properties dialog box.

   – **RAID 10, 50 (Dual-Level Arrays)**—Highlight the array member you want to view, then press **Enter** to display the second level. Press **Enter** again to display the physical disks associated with the array.

> **Note:** Failed drives are displayed in a different text color.

3   Press **Esc** to return to the previous menu.

Making an Array Bootable

> **Notes:**
>
> ■   If the controller is not a boot device, you can disable its runtime BIOS. (For details, see the table on .) When the BIOS is disabled, it does not occupy any of the expansion ROM region of the system's memory map. In a system with several expansion ROMs, disabling the BIOS may be helpful.
>
> ■   The controller always uses the lowest numbered array as its bootable array. If you delete Array 00, the next lowest numbered array becomes the bootable array.
>
> ■   You cannot make a non-00 array bootable while the array is in a build/verify or rebuild process.
>
> ■   You may need to change the system BIOS to modify the boot order. For more information, refer to the system documentation.

You can make an array bootable so that the system boots from the array instead of from a stand-alone (single) disk. To make an array bootable:

1 From the ACU main menu, select **Manage Arrays**.

2 Select the array you want to make bootable, then press **Ctrl+B**. This changes the selected array's number to 00, making it the controller's boot array.

3 Restart the computer.

Deleting Arrays

⚠ **Caution:** When you delete an array, you delete all the data from the array. Before proceeding, back up any data.

To delete an existing array:

1 From the ACU main menu, select **Manage Arrays**.

2 Select the array you want to delete, then press **Delete**.

3 In the Array Properties dialog box, press **Delete** again, then press **Enter**. the following message is displayed:

Warning!! Deleting will erase all data from the array.
Do you still want to continue? (Yes/No):

4 Select **Yes** to delete the array, or **No** to return to the previous menu. At the Array Properties dialog box, select **Delete** again, then press **Enter**.

5 Press **Esc** to return to the previous menu.

Managing Failover Drive Assignments

To assign a hotspare to an array:

1 Select **Manage Arrays** from the main menu.

2 From the List of Arrays dialog box, select the array to which you want to assign a hotspare, then press **Ctrl+S**. The Hotspare Management for Array dialog box is displayed, which shows the drives that can be assigned as hotspares.

3 Select a drive, then press **Insert** to assign the drive as a hotspare. The specified drive is displayed in the Assigned Hotspares drives list.

4 Press **Enter** to save the hotspare assignment.

5 If you are finished managing hotspares, press **Y** (for yes) when prompted to return to the main menu.

To remove an assigned hotspare from an array:

1 Select **Manage Arrays** from the main menu.

2 From the **List of Arrays** dialog box, select the array from which you want to remove the assigned hotspare, then press **Ctrl+S**. The Hotspare Management for Array dialog box is displayed, which shows drives that can be assigned as hotspares and drives that are already assigned as hotspares.

3 From the Assigned Hotspares drives list, select the drive to be removed, then press **Delete**. The specified drive is displayed in the Select Hotspares drives list.

4 Press **Enter** to save the removed hotspare assignment.

5 If you are finished managing hotspares, press **Y** (for yes) when prompted to return to the main menu.

Initializing Drives

If a correctly installed disk does not appear in the disk selection list for creating a new array, or it appears grayed out, you need to initialize it.

⚠️ **Caution:**

■ During initialization, all data is deleted from the disk. Before proceeding, back up any data.

■ If the drive is already used in an array, initialization may make the array unusable.

■ Do not initialize a disk that is part of a boot array. The boot array is the lowest numbered array (normally 00) in the List of Arrays dialog box. For information on determining which disks are associated with a particular array, see *Viewing Array Properties* on page A-5.

To initialize drives:

1 Restart the computer, then press **Ctrl+A** when prompted to access the ARC utility.

2 From the ARC menu, select **Array Configuration Utility**.

3 Select **Initialize Drives**.

4 Browse with the arrow keys to select a channel.

5 Browse with the arrow keys to highlight the disk you want to initialize, then press **Insert**.

6 Repeat Step 5 until all the drives to be initialized are selected.

7 Press **Enter**.

8 Read the warning message, ensure that you have selected the correct drives to initialize, and then press **Y** to continue.

Rescanning Drives

To rescan the drives connected to the controller:

1 Restart the computer, then press **Ctrl+A** when prompted to access the ARC utility.

2 From the ARC menu, select **Array Configuration Utility**.

3 Select **Rescan Drives**.

Using SATA*Select* and SCSI*Select*

The SATA*Select* and SCSI*Select* utilities allow you to change controller and device settings without opening the computer cabinet or handling the controller. To access these utilities:

1 Restart the computer, then press **Ctrl+A** when prompted to access the ARC utility.

2 If multiple controllers are installed, select the controller you want to configure, then press **Enter**.

3 From the ARC menu, select **SATA*Select* Utility** or **SCSI*Select* Utility**.

The available options are listed in the table below.

This section...	Applies to...
Controller Configuration Options	All controllers
SATA Configuration Options	SATA controllers only
SCSI Configuration Options	SCSI controllers only

These options are discussed in the sections that follow.

To select a menu option, browse with the arrow keys to the option, then press **Enter**. In some cases, selecting an option displays another menu. You can return to the previous menu at any time by pressing **Esc**.

To restore the original default values, return to Configure/View Host Adapter Settings, then press **F6**.

4 To exit the utility, press **Esc** until a message prompts you to exit. (If you changed any host adapter settings, you are prompted to save the changes before you exit.) Choose **Yes** to exit and restart the computer. Any changes you made take effect after restart.

Controller Configuration Options

The Controller Configuration options are described in the table below.

Option	Default	Models Affected	Description
Drives Write Cache	Drive's Default	All	When *Enabled*, write cache is enabled, providing maximum drive performance. When *Disabled*, no write cache is used on the drive. By default, the drive's setting is used. **Caution**—When *Enabled*, there is a slight possibility (less than with controller cache) of data loss or corruption during a power failure.
Runtime BIOS	Enabled	All	When *Enabled*, the controller BIOS allows the controller to act as a bootable device. Disabling the BIOS allows another suitable controller to act as the boot device.
Automatic Failover	Enabled	All	When *Enabled*, the controller automatically rebuilds an array when the failed drive is replaced. When disabled, the array must be rebuilt manually.
Array Background Consistency Check	Disabled	All	When *Enabled*, the controller constantly performs a verification on a redundant array to data integrity. In the case of RAID 1 or 10, consistency checks assure that the data between like blocks match. In the case of a RAID 5 or a RAID 0, consistency checks assure that data in the stripe and the calculated parity for the stripe match. Consistency checking processes reduce performance. For a RAID 5 or a RAID 50, the performance reduction is significant.
BBS Support	Enabled	See note [1]	When *Enabled* in systems that support BBS, controller is presented as a bootable device in the host system's BIOS for boot device selection.

Option	Default	Models Affected	Description
Array-based BBS Support	Disabled	All	When *Enabled* in systems that support BBS, the controller presents attached bootable devices up to the host system's BIOS for boot device selection. This is relevant for logical arrays.
Physical Drives Display during POST	Disabled	All	When *Enabled*, attached physical devices are displayed during system POST. Displaying the devices adds a few seconds to the overall POST time.
CD-ROM Boot Support	Enabled	SCSI only	When *Enabled*, the system can be booted from a bootable CD.
Removable Media Devices Support	Enabled	SCSI only	When *Enabled*, removable media devices, such as CD drives and Zip drives, are supported.
Alarm Control	Enabled	See note [2]	When *Enabled*, the alarm sounds.

1. BBS systems containing SCSI controllers only.
2. Adaptec 2120S/2200S only.

SATA Configuration Options

The SATA Configuration options are described in the table below.

Option	Default	Models Affected	Description
Write Cache	Yes	All SATA controllers	When *Enabled*, write cache is enabled, providing maximum performance. **Caution**—When *Enabled*, there is a potential for data loss or corruption during a power failure.
DMA	Yes	Adaptec 2410SA only	When *Enabled*, Direct Memory Access (DMA) mode is used for the drive, providing maximum performance.
SMART	Yes	Adaptec 2410SA only	Controls the predictive failure feature of the drive. When *Enabled* and the drive supports Self-Monitoring, Analysis and Reporting Technology (SMART) configuration, the SMART status of the drive (Healthy or Failed) is displayed along with the physical drive display during POST. Messages are logged to the Storage Manager log file when they occur. When Event Broadcasting is enabled for your operating system, SMART events are also sent to destinations according to the system's particular configuration (for example, system log file, Event Viewer, pop ups, email, etc.) When *Disabled*, or when the drive does not support SMART, the SMART status is not displayed.
Allow Read Ahead	Yes	Adaptec 2410SA only	When *Enabled*, the drive's read ahead cache algorithm is use, providing maximum performance under most circumstances.

SCSI Configuration Options

To access the SCSI Device Configuration options, select **SCSI Configuration**.

SCSI Channel Interface Definitions

The SCSI Channel Interface Definitions are described in the table below.

Option	Default	Description
Controller SCSI Channel ID	7	Sets the controller's SCSI ID. Adaptec recommends that you leave the controller set to the default, which gives it the highest priority on the SCSI channel.
SCSI Parity Checking	Enabled	Determines whether the controller verifies the accuracy of data transfer on the SCSI channel. You should disable SCSI Parity Checking on the controller and all SCSI devices if any SCSI device supported by the controller does not support SCSI parity; otherwise, retain the default. Most SCSI devices do support SCSI parity. If you are not sure whether a device supports SCSI parity, consult the documentation for the device.
Controller SCSI Channel Termination	Auto Mode	Sets termination on the controller. Adaptec recommends that you retain the default setting.

SCSI Device Configuration Options

The SCSI device settings allow you to configure certain parameters for each device on the SCSI channel. To configure settings for a specific device, you must know the SCSI ID assigned to that device. If you are not sure of the SCSI ID, see *Using the Disk Utilities* on page A-15.

To access the SCSI Device Configuration options, select **SCSI Configuration**, then select **Additional Options**. The SCSI Device Configuration options are described in the table below.

> **Note:** For maximum performance, Adaptec recommends that you retain the default settings.

SCSI Device Configuration Options

Option	Default	Description
Maximum Transfer Rate	N/A	Determines the maximum data transfer rate that the SCSI channel supports. The maximum effective data transfer rate is doubled when *Initiate Wide Negotiation* is set to *Yes* and 16-bit devices are attached. (*Initiate Wide Negotiation* has no effect with 8-bit devices.)
Enable Disconnection	Yes	Determines whether the SCSI channel allows the SCSI device to disconnect from the SCSI channel (sometimes called Disconnect/Reconnect or Reselection).
Initiate Wide Negotiation	Yes	Determines whether the SCSI channel attempts 16-bit data transfer instead of 8-bit data transfer. The effective data transfer rate is doubled when 16-bit data transfer is used.
QAS	No[1]	Determines whether QAS (Quick Arbitration and Selection) is used to eliminate overhead and speed up data transfers on the SCSI bus.
Packetized	Yes	Determines whether SCSI packetization (encapsulation) is used to reduce overhead and speed data transfer. The packetized SCSI protocol provides a method for transferring command and status information at the maximum rate.

1. Adaptec recommends that you not enable QAS if you are using an enclosure that contains Ultra320 expander ICs.

Using the Disk Utilities

The disk utilities allow you to low-level format or verify the media of the hard drives. To access the disk utilities:

1 Restart the computer, then press **Ctrl+A** when prompted to access the ARC utility.

2 If multiple controllers are installed, select the controller you want to configure, then press **Enter**.

3 From the ARC menu, select **Disk Utilities**.

4 Select the desired disk, then press **Enter**.

You are offered the following options:

– **Format Disk**—The functionality depends on the controller type, as described below:

– **SATA Controllers**—Simulates a format of the hard drive by removing the file system and writing zeros to the entire disk.

– **SCSI Controllers**—Performs a low-level format.

Most drives are formatted at the factory and do not need to be formatted again.

> ⚠ **Caution:** During formatting, all data is destroyed. Before proceeding, back up any data.

– **Verify Disk Media**—Scans the media of a drive for defects. Any errors found are corrected.

Viewing the Event Log

The BIOS-based event log stores all firmware events (configuration changes, array creation, boot activity, and so on).

The event log has a fixed size. Once full, old events are flushed as new events are stored. Also, the log is volatile; therefore, it is cleared after each system restart.

To access the event log:

1 Restart the computer, then press **Ctrl+A** when prompted to access the ARC utility.

2 If multiple controllers are installed, select the controller you want to configure, then press **Enter**.

3 From the ARC menu, press **Ctrl+P**.

The Controller Service Menu appears.

4 Select **Controller Log Information**, then press **Enter**. The current log is displayed.

B

ACU for DOS

In this Appendix...

Introduction

The Array Configuration Utility (ACU) allows you to create, configure, and manage arrays.

Creating the ACU Utility Disk

The DOS version of this utility runs from a floppy disk that you need to create using the following procedure:

1 To find the ACU executable, acu.exe, browse to the folder on the Adaptec installation CD that relates to your controller model.

Adaptec Model	Path
2020ZCR	packages/firmware/adp2020ZCR
2120S	packages/firmware/adp2120S
21610SA	packages/firmware/adp21610SA
2200S	packages/firmware/adp2200S
2410SA	packages/firmware/adp2410SA
2810SA	packages/firmware/adp2810SA

2 Insert a bootable floppy disk and copy acu.exe to it.

Running the ACU Interactively

To run the ACU interactively:

1 Insert the ACU utility disk you created in *Creating the ACU Utility Disk*.

2 Start or restart your computer.

The computer boots to the DOS command line.

3 Type ACU on the command line, then press **Enter**.

Select ACU options as needed using the arrow keys and the Tab key navigate through the menus and the Enter key to select from the following tasks:

■ *Creating Arrays*

■ *Managing Arrays*

■ *Initializing Drives*

■ *Rescanning Drives*

> **Note:** To return to the previous menu at any time, press **Esc**.

For details on using the ACU interactively, see *Using the ACU* on page A-2.

Running the ACU Using Scripts

To use the ACU scripting features, use the ACU command, specify a script file (see *Creating the Script File Manually* on page B-5), and specify one (but not both) of the *required* switches listed in the table below. You may also add one or both of the optional switches listed in the table.

> **Note:** Command line syntax is *not* case sensitive.

Switch	Type	Description
/P <file>	Required	**Playback Mode**—In this mode, the ACU reads the contents of the specified script file and creates arrays and configures channel settings based on the keywords defined in the script. For more details, see *Playback Mode* on page B-4. **Note:** The ACU exits with an error if you do not include either the /P or the /R switch (but not both).
/R <file>	Required	**Record Mode**—The ACU writes a controller's existing array configuration to a specified script file, enabling you to create the same configuration by running the ACU in playback mode (/p switch) with the resulting script. For more details, see *Record Mode* on page B-4. **Note:** The ACU exits with an error if you do not include either the /P or the /R switch (but not both).
/L <file>	Optional	**Optional Log Filename Switch**—If you include this switch, the ACU records its activity and any errors it encounters in the log file. If you do not include this switch, the ACU displays any status and errors on the screen. The *file* is a standard MS-DOS file, which can include a drive, directory, filename, and extension. Only the filename and extension (.LOG) are required. If no drive or directory is specified, the file is placed in the location of the ACU executable.
/C <number>	Optional	**Optional Controller Number Switch**—In systems with more than one controller, this switch specifies which controller to change, where *<number>* is the controller number. The default controller number is *0*. **Note:** The number assigned to a particular controller depends on the controller's physical PCI slot and the order in which your system scans its PCI slots.

Playback Mode

In this mode, the ACU reads the contents of the specified script file and creates arrays based on the keywords specified in the script.

The syntax is ACU /P <*file*> where *file* is the parameter specifying name of the script file. The *file* parameter can include a drive, directory, filename, and extension. If no drive or directory is specified, the file is placed in the location of the ACU executable.

> **Note:** The script file syntax allows only a single hotspare to be assigned to any given array. Therefore, when recording a RAID 10, the ACU cannot map hotspares assigned to the individual mirror sets in the resulting script file. Instead, the ACU creates a single HotspareDrives list for all hotspares assigned to the RAID 10. For details, see the *Method Keyword on page B-9*.

Record Mode

There are two methods available for creating a script file:

■ Use Record Mode.

■ Create the script manually. (See page B-5.)

Regardless of which method you use to create the script, you need to use *Playback Mode* (/P) to use the script.

In Record Mode, the ACU writes a controller's existing array configuration to a specified script file, enabling you to create the same configuration by running the ACU in Playback Mode (/P switch) with the resulting script.

The syntax is ACU /R <*file*> where *file* is the parameter specifying name of the script file. The *file* parameter can include a drive, directory, filename, and extension, but only the filename and extension are required. If no drive or directory is specified, the file is placed in the location of the ACU executable.

Notes:

■ Record Mode can be used to record only one controller at a time. Therefore, if you want to record multiple controllers, record them separately using separate script files.

■ Because the ACU supports only a subset of array types available, it cannot record all the possible array configurations. If the ACU encounters an array that it cannot create, it displays a warning (or records the warning in the log file, if the /L switch is used) and does not record any keywords for that array in its script file.

■ When recording an array, the ACU always uses the default Wait setting (equivalent to Wait=Yes) unless you edit the script file and include Wait=No in the array's definition block. For details, see the *Wait Keyword* on page B-11

Creating the Script File Manually

Script files contain the following structures, or blocks:

■ *Array Definition Block Keywords*

■ *Channel Definition Block Keywords – SCSI only* (optional)

The rules for syntax are as follows:

■ Each keyword must start its own line.

■ The syntax is *not* case sensitive.

Comments

To enter a comment in the script file, start with a pound character (#). You can start anywhere on a line. For a sample script that includes comments, see *Example – Running the ACU with a Script* on page B-14.

Array Definition Block Keywords

The array definition block always begins with the keyword Array and ends with the keyword End. The other *required* array definition keywords are Drives and Type. The array definition keywords are listed in the table below alphabetically.

Keyword	Required?	Default Value	Description
Array	Yes	None	Indicates the start of an array definition block. See page B-7).
Drives	Yes	None	Specifies the devices used in creating the array. See page B-7).
End	Yes	None	Indicates the end of an array definition block. See page B-7 for details.
HotspareDrives	No	None	Specifies the hotspares to assign to the array. See page B-8).
InitializeAll	No	No	Indicates whether to initialize all the drives connected to the controller. See page B-8).
Method	Yes	Build	Indicates the method (Build/Verify, Clear, or Quick Init) to use when creating a redundant array (see page B-9.
ReadCache	No	Yes	Indicates whether read caching is enabled for this array (see page B-10).
Size	No	Maximum	Specifies the size of the array (see page B-10).
StripeSize	No	64	Specifies the size of contiguous I/O, in bytes (see page B-10).
Type	Yes	None	Indicates the type of array to create (see page B-9).
Wait	No	Yes	Indicates whether the ACU should wait for the new array's build/verify or clear to complete before continuing (see page B-11).
WriteCache	No	Yes	Indicates whether write caching is enabled for this array (see page B-11).

The keywords are described in detail in the sections that follow.

Array Keyword

Array is a required keyword, indicating the start of an array definition block. The syntax is Array=<*label*>, where *label* is an optional alphanumeric string.

Examples

```
Array
Array=MyData
```

Drives Keyword

Drives is a required keyword, specifying the devices to use in creating the array. There is no default value.

A drive is identified by its channel number, ID (target), and LUN, separated by colons; for example, 0:0:0 or 0:1:0. Separate multiple drive identifiers with commas.

Prior to creating any new arrays, the ACU initializes any drives specified by the Drives keyword. If a drive is specified in more than one array definition block in a script, it is initialized only once.

> ⚠ **Caution:** Any drive specified within the script file is initialized, which destroys any data on that drive.

Examples

```
Drives=0:0:0
Drives=0:0:0,0:1:0,0:2:0
```

End Keyword

End is a required keyword, indicating the end of the block.

Example

```
End
```

HotspareDrives Keyword

HotspareDrives is an optional keyword, specifying the hotspares to assign to the array. The syntax for listing hotspares is the same as the *Drives Keyword* on page B-7. If HotspareDrives is not specified, no hotspares are assigned to the array.

✓ **Notes:**

- HotspareDrives creates only dedicated hotspares. If the same drive is assigned to protect multiple arrays, only the last array that drive is assigned to is protected.

- HotspareDrives does not verify that the available space on the specified hotspares is sufficient to serve as failover for the array.

- When assigning hotspares to a multilevel array, HotspareDrives assigns all the hotspares in the list to *all* arrays within the multilevel array.

Example

```
HotspareDrives=0:0:0,0:1:0
```

InitializeAll Keyword

If you want the ACU to initialize all drives connected to the controller and delete any existing arrays before any new arrays are created, even those that are not specified in any Drives keyword definition, specify InitializeAll=yes. Otherwise, the ACU initializes only those drives specified by the Drives keyword.

⚠ **Caution:** Initializing a drive automatically deletes any existing arrays with that drive as their member.

> ![checkmark] **Notes:**
> - `InitializeAll` is a global keyword that you need to specify only once.
> - `InitializeAll` is always performed prior to array creation regardless of its position in the script.
> - If both `InitializeAll=Yes` and `InitializeAll=No` are specified in the same script file, `InitializeAll=Yes` is always the overriding value.
> - If an array is deleted during a build/verify process, the process is automatically terminated.

Possible values are as follows:

- **Yes**—Initialize all drives.
- **No** (the *default*)—Do not initialize all drives; only those drives specified with the `Drives` keyword are initialized.

Examples
```
Type=Volume
Type=RAID1
```

Method Keyword

`Method` is an optional keyword, indicating which method to use when creating a redundant (RAID 1, 5, and 10) array. Possible values are:

- **Build** (the *default*)—Perform a build/verify process on the array. Takes longer than `Clear`, but allows you to begin using the array immediately.
- **Clear**—Clear the array. Faster than a build/verify process, but you have to wait for the operation to be completed before you can begin using the array.
- **Quick Init**—Makes the array available immediately, but does not accomplish a build/verify. Parity and mirror information is created as data is written to the drive (called full-stripe write mode), which reduces overall array performance. Maximum performance is achieved by starting and completing a build/verify.

Example
```
Method=Build
```

ReadCache Keyword

ReadCache indicates whether the array uses read caching.

Possible values are:

- **Yes** (the *default*)—Enable read caching.
- **No**—Disable read caching.

Example
```
ReadCache=Yes
```

Size Keyword

The Size keyword specifies the size of the array. Specify Maximum (the default) to create an array using the maximum available space, based on the array type and drives selected. Otherwise, specify the size as an integer or a decimal number, followed by the unit keyword MB (megabytes), GB (gigabytes), or TB (terabytes).

> **Note:** A unit keyword is required with a numeric size value. If no unit keyword is specified, the ACU exits with an error.

Examples
```
Size=2.5GB
Size=300MB
Size=Maximum
```

StripeSize Keyword

> **Note:** This keyword does not support RAID 50 arrays because RAID 50 arrays support only a stripe size of 64 KB.

The StripeSize keyword specifies the stripe size (in MB) written to each member of a striped (RAID 0, RAID 5, RAID 10) array.

The possible values for StripeSize are 16 KB, 32 KB, and *64* KB (the default).

Example
```
StripeSize=64
```

Type Keyword

`Type` is a required keyword, indicating the array type. There is no default value. The `Type` keyword values are:

- `Volume`
- `RAID5`
- `RAID0`
- `RAID10`
- `RAID1`
- `RAID50`

> **Note:** For information about which array types your controller supports, see *Controller Features* on page 1-5.

Wait Keyword

`Wait` is an optional keyword that you can use to tell the ACU to allow the ACU to continue while the build/verify or clear completes in the background; specify `wait=no`. Otherwise, the ACU waits by default.

> **Note:** If the host is powered off before the build/verify or clear process completes and is then restarted, the process resumes without any user intervention.

Examples
```
Wait=Yes
Wait=No
```

WriteCache Keyword

The `WriteCache` keyword indicates whether write caching is used for this array if write caching is supported for the system. Possible values are as follows:

- **Yes** (the *default*)—Enable the write cache.
- **No**—Disable the write cache.

> **Note:** Setting an array's `WriteCache` keyword to `Yes` might result in data loss or corruption during a power failure.

Example
```
WriteCache=Yes
```

Channel Definition Block Keywords – SCSI only

The channel definition block is optional. If used, it always begins with the keyword Channel and ends with the keyword End. The channel definition block keywords are listed in the table below.

Keyword	Description
Channel	Used to identify the channel.
End	Indicates the end of a channel definition block.
ControllerID	Changes the SCSI ID of the controller.

Channel Keyword

Channel is an optional keyword that begins a channel definition block and specifies the channel number to which the channel keywords apply. Channels are numbered from zero to the maximum number of channels on the controller minus one.

You can include multiple channel definition blocks within a script file, each beginning with a Channel keyword and value. For example:

Example

```
Channel=0
```

ControllerID Keyword

ConrollerID is an optional keyword to change the SCSI ID of the controller. Normally, the SCSI controller is assigned SCSI ID 7 on each of its channels. You can specify any ID value between 0 and 7.

⚠️ **Caution:** *Do not* change the SCSI ID of the controller unless directed to do so by Adaptec Technical Support.

Example

```
ControllerID=7
```

End Keyword

End is a required keyword, indicating the end of the block.

Example

```
End
```

ACU Error Codes

When the ACU detects an error, it reports the error and exits immediately. If a log file is specified, the ACU writes the error code to the log file. Otherwise, it displays the error code on the screen.

The possible error messages returned by the ACU are listed in the table below.

ACU Error Codes

Code	Description
0	**ACU ran without changes**—The ACU exited with no errors (success) and no report is required.
1	**No controller found**—The ACU did not detect any controllers in the system.
2	**Syntax or logical error in the script file**—The ACU encountered an invalid command or keyword in the specified script file.
3	**Unable to open file**—The ACU was unable to open the specified script or log file.
4	**Error in the command line parameters**—You passed an invalid command-line switch to the ACU. (See *Running the ACU Using Scripts* on page B-3 for the list of valid command-line switches.)
5	**Unable to read system configuration**—The ACU was unable to get the configuration information from the specified controller.
6	**No drives detected**—The ACU did not detect any devices attached to the selected controller.
7	**Specified drive not found in system**—The device you specified does not exist on the selected controller.
8	**Specified array size too small**—You specified an array size that is smaller than the minimum size allowed for this array.
9	**Specified array size too big**—You specified an array size that is larger than the maximum size allowed for this array.
10	**Number of drives do not match the array type**—The number of drives you selected is invalid for the type of array specified.
11	**Unable to initialize drive**—The ACU was unable to initialize one or more devices.
12	**Error occurred while creating array**—The ACU encountered an error creating an array.
13	**Too many spare drives assigned**—You attempted to assign more than the maximum number of hotspares allowed for the specified array.

ACU Error Codes "Continued"

Code	Description
14	**Insufficient memory to run the application**—There is not enough memory to run the ACU.
15	**Incorrect controller number**—The controller number you specified is invalid or out-of-range.
16	**Controller not responding**—The controller has stopped responding to the ACU.
17	**Build/Verify/Clear failed**—The build/verify or clear operation for one or more arrays has failed.
100	**You ran ACU and made changes**—The ACU exited with no errors (success) and you must restart the computer.

Example – Running the ACU with a Script

The following MS-DOS command invokes the ACU and creates arrays on controller 1 based on the array keywords defined in the script file A:\RAID.ACU. It also configures Channel 0 and saves a log of the operation in the log file C:\RAID.LOG.

```
A:\> ACU /P A:\RAID.ACU /L C:\RAID.LOG /C1
```

The following sample script file is a sample RAID.ACU script as referred to in the previous ACU command. This script creates the following arrays—a 500 MB, single-disk volume and a 2-GB, two-drive RAID 1 with a hotspare:

```
# Script to create volume, mirror, and RAID 5 arrays
# Create a 500MB volume labeled 'MySystem'
Array=MySystem
Type=Volume
Size=500MB
Drives=0:0:0
End
# Create a 2GB mirror labeled 'MyMirror'
Array=MyMirror
Type=RAID1
Size=2GB
# Use drives 1 and 2
Drives=0:1:0,0:2:0
# Disable write cache
WriteCache=No
# Assign 1 spare drive
HotspareDrives=0:3:0
End
```

The following sample script file creates a maximum-size three-drive RAID 5.

```
# Create a maximum size RAID 5 labeled 'MyData'
Array=MyData
Type=RAID5
Size=Maximum
# Use the maximum stripe size
StripeSize=64
# Clear the array (don't build/verify it)
Method=Clear
# Don't wait for clear to complete
Wait=No
# Use drives 0, 1, 2
Drives=0:0:0, 0:1:0, 0:2:0
End
```

C

Adaptec Flash Utility (AFU)

In this Appendix...

Introduction

The Adaptec Flash Utility (AFU) is a DOS utility used to update, save, or verify RAID controller firmware BIOS, and NVRAM.

⚠ **Caution:** The AFU is easy to use and contains safeguards to prevent you from accidentally damaging the controller's flash contents. Still, *you must be careful to use the AFU correctly*, otherwise, you could render the controller inoperable.

✓ **Note:** If you are updating multiple controllers in the same system, update the boot controller's flash first, restart the computer, and then update the flash for any remaining controllers.

The AFU is used to:

- **Update**—Updates all the flash components on a controller with the flash image data from a User Flash Image (UFI) file.

  The AFU updates the controller's flash by reading UFI files and writing them to the controller's flash components.

  Note: The UFI includes the controller's type, thereby ensuring that the AFU uses the correct file.

- **Save**—Reads the contents of a controller's flash components and saves the data to a UFI file. This allows you to later restore a controller's flash to its previous contents should the need arise.
- **Verify**—Reads the contents of a controller's flash components and compares it to the contents of the specified UFI file.
- **Version**—Displays version information about a controller's flash components.
- **List**—Lists all supported controllers detected in your system.

System Requirements

The requirements for AFU are as follows:

- MS–DOS version 5.0 or later. It cannot run from a DOS command prompt window under any version of Windows.
- At least 8 MB of extended memory.

  Note: You cannot create the bootable floppy using Windows 2000.

Compatibility

The AFU has the following compatibility issues:

- Supports HIMEM.SYS; compatible with other DOS drivers running under HIMEM.SYS (for example, SMARTDRV.SYS and SETVER.SYS).
- *Does not support* DOS extenders installed in memory, such as EMM386.SYS and DOS4GW.

Firmware and UFI File Locations

The firmware and UFI file locations on the Adaptec Installation CD are as follows

Creating the Firmware Floppy Disks

Controller firmware is available two ways:

■ **From the Adaptec installation CD**—The CD includes the AFU executable, AFU.exe, the corresponding documentation, and a separate flash image. The flash image may be comprised of multiple UFI files.

You can locate the necessary files on the Adaptec installation CD at the locations listed below.

Adaptec Model	Path
2020ZCR	/packages/firmware/adp2020ZCR
2120S	/packages/firmware/adp2120S
21610SA	/packages/firmware/adp21610SA
2200S	/packages/firmware/adp2200S
2410SA	/packages/firmware/adp2410SA
2810SA	/packages/firmware/adp2810SA

■ **From the Adaptec Web site**—When you download a new firmware file, you usually get the most recent version of AFU, too.

To create a controller firmware kit on floppy disks:

Note: You cannot create the bootable floppy using Windows 2000.

1 Create a bootable MS–DOS floppy disk and copy the following files to this disk:

 – AFU.exe

 – AA*xxx*01.ufi

 where *xxx* is the model number of your controller.

2 Create additional bootable MS–DOS floppy disks and copy each additional AA*xxx*0x.ufi files to a separate disk. (Some controllers have two UFI files; some have four.)

3 Start the AFU as described in *Running the AFU from the GUI* on page C-4 and follow the prompts.

Running the AFU from the GUI

The easy way to run the AFU is to use its Graphical User Interface (GUI). If you prefer to run the AFU from the command line, see page C-5.

To access the AFU:

1 Create the firmware floppy disks, as described in *Creating the Firmware Floppy Disks* on page C-3.

2 Shut down your operating system and reboot to DOS from a bootable MS-DOS floppy disk or from a DOS partition on a bootable drive. (You can use the drive connected to the controller you are updating.)

> **Note:** When you are updating the controller flash, no I/O is possible. Before you can use the controller again, complete the flash operation and restart the computer.

3 At the DOS command prompt (typically A:\>), type AFU with no arguments.

The AFU's main menu is displayed.

4 Choose **Select Controllers** and select the Adaptec RAID controllers to be flashed.

5 Choose **Select an Operation**.

6 Choose any available AFU function and follow the on-screen instructions.

Running the AFU from the Command Line

At the DOS command prompt (typically A:\>), type AFU followed by a command and any switches. The AFU processes the command, prompts you to insert additional floppy disks as needed, exits, and reports success or an error message code.

Command Summary

This section describes each of the AFU commands in detail. The commands appear alphabetically.

HELP

The HELP command displays a summary of AFU functions and command switches.

Examples

The following are examples of command syntax that will work to get help:

```
A:\> AFU HELP
A:\> AFU /?
```

LIST

The LIST command displays the AFU-supported controllers installed on your computer. Use this command to see which controllers are installed on this system, or to identify the ID numbers assigned to each physical controller.

You do not have to restart the computer upon completion of this command.

Example

The following example shows typical system output in response to a LIST command.

```
A:\> AFU LIST
Adaptec Flash Utility V4.0-0 B5749
(c)Adaptec Inc. 1999-2002. All Rights Reserved.
Controllers Detected and Recognized:
Controller #0 (03:05:00) Adaptec 2410
```

SAVE

The SAVE command saves the contents of a controller's flash in a UFI file. The name of the UFI file is based on the controller type and cannot be changed.

You must restart the computer following a SAVE command.

Command Syntax

The command syntax for the SAVE command is as follows:

```
AFU SAVE [/C<Controller ID>] [/D <UFI File Path>]
```

Command Switches

The following switches are available:

■ /C *<Controller ID>* is one or more controller IDs representing the set of controllers on which to perform the specified command. The default is 0, which means that if the computer has multiple controllers, the AFU defaults to controller 0 unless you specify otherwise.

You can specify a single controller ID, for example:

/C 0

multiple IDs separated by commas, for example:

/C 0,2

or ALL to indicate all controllers.

> **Note:** If the controller you want using the e /C switch; otherwise, the AFU displays an error message and exits.

■ /D <UFI File Path> specifies the path (drive and directory) where the UFI files are located. If you do not specify the /D switch, the AFU looks for, or creates, its UFI files in the default location.

> **Note:** You cannot specify the name of a UFI file, only its path. UFI filenames are predefined, based on the controller type.

Examples

In the following example, the AFU saves flash contents from controller 0 to a UFI file in the current default drive and directory:

```
A:\> AFU SAVE /C 0
```

In the following example, the AFU saves flash contents from Controller 1 to a UFI file in `C:\UFI_FILES`.

```
A:\> AFU SAVE /C 1 /D C:\UFI_FILES
```

UPDATE

The UPDATE command updates a controller's flash components from the flash image data in a UFI file. You can use the UPDATE command to update a single controller's flash components or to update multiple controllers on your computer.

You must restart the computer following an UPDATE command.

Command Syntax

The command syntax for the UPDATE command is as follows:

```
AFU UPDATE [/C<Controller ID>] [/D <UFI File Path>]
```

Command Switches

For details on the /C and /D switches, see the *SAVE* command on page C-6.

Example

The following example shows typical system response after an update has been performed.

```
A:\> AFU UPDATE /C 0
Adaptec Flash Utility V4.0-0 B5749
(c)Adaptec Inc. 1999-2002. All Rights Reserved.
Updating Controller 0 (Adaptec 2410)
Reading flash image file (Build 5749)
AFU is about to update firmware on controllers Adaptec 2410
***PLEASE DO NOT REBOOT THE SYSTEM DURING THE UPDATE***
This might take a few minutes.
Writing Adaptec 2410 (4MB) Flash Image to controller 0...OK.
Verifying...OK
Please restart the computer to allow firmware changes to take
effect.
```

VERIFY

The VERIFY command compares the contents of each of the flash components on a controller to the corresponding image in a UFI file and indicates whether they match. Use this command to determine whether a controller's flash components are up-to-date when compared to a specific UFI file.

After using the VERIFY command, you must restart the computer upon completion of this command.

Command Syntax

The command syntax for the VERIFY command is as follows:

```
AFU VERIFY [/C<Controller ID>] [/D <UFI File Path>]
```

Command Switches

For details on the /C and /D switches, see the *SAVE* command on page C-6.

Example

The following example shows a typical display resulting from a verify operation.

```
A:\> AFU VERIFY /C 0
Adaptec Flash Utility V4.0-0 B5749
(c)Adaptec Inc. 1999-2002. All Rights Reserved.
Reading flash image file (Build 5748)
Controller #0: Adaptec 2410
ROM: Checksum: 797B [VALID] (Build 5748)
File: Checksum: 797B [VALID] (Build 5748)
            Image Compares Correctly
```

VERSION

The VERSION command displays version information about the flash components on a controller.

After using the VERSION command, you must restart the computer upon completion of this command.

Command Syntax

The command syntax for the VERSION command is as follows:

```
AFU VERSION [/C<Controller ID>]
```

Command Switches

For details on the /C switch, see the *SAVE* command on page C-6.

Example

The following example displays version information about all supported controllers.

```
A:\> AFU VERSION /C 0
Adaptec Flash Utility V4.0-0 B5749
(c)Adaptec Inc. 1999–2002. All Rights Reserved.
Version Information for Controller #0 (Adaptec 2410)
ROM: Build 5748 [VALID] Fri Sep 27 13:28:40 EDT 2002
A:\> AFU VERSION /C ALL
```

AFU Command Line – Step-by-Step

This section provides step-by step instructions for updating your the flash.

To update the flash using the AFU command line:

1 Create the firmware floppy disks, as described in *Creating the Firmware Floppy Disks* on page C-3.

2 Shut down the computer.

3 Insert the bootable disk that contains the AFU utility.

4 Turn on the computer.

5 Enter the system setup utility and verify that your computer is set up to boot from the bootable disk.

6 *If you have multiple controllers only*—At the DOS prompt, type afu list and press **Enter**.

This command displays the Adaptec RAID controllers in your system. Note the controller number for the controller you want to update; you may need it in Step 7 to perform the update.

7 You can updated the flash using any of the following alternatives:

   a **Updating the Flash on a Single Controller**—To flash the firmware on a single controller, type:

   afu update /C <*controller_number*>

   Where <*controller_number*> is the number of the controller whose firmware you are updating. For example, to upgrade Controller 0, type:

   afu update /C 0

b **Updating the Flash on Multiple Controllers**—To flash the firmware on multiple controllers, type:

```
afu update /C <controller_number_a>,<controller_number_b>
```

Where `<controller_number_a>` and `<controller_number_b>` is the number of one of the Adaptec RAID controllers whose firmware you are updating.

To upgrade controllers 0, 2, and 3 for example, type:

```
afu update /C 0, 2, 3
```

c **Updating the Flash on All Controllers Simultaneously**—To flash the firmware on all controllers, type:

```
afu update /C all
```

> **Note:** The UFI file identifies the appropriate controllers, so you do not have to worry about flashing the wrong controller.

8 The AFU prompts you to put in the first firmware disk.

When it detects that the disk is in the drive, the AFU reads the part of the firmware image contained on the first disk.

9 When prompted, remove the first firmware disk and insert the second firmware disk.

10 If necessary, repeat Step 9 until the process is complete.

D

Command Line Interface

In this Appendix...

Introduction

The Command Line Interface (CLI) allows you to configure and manage controller components. The CLI contains most of the functionality offered by Adaptec Storage Manager, plus some additional functionality not offered by Adaptec Storage Manager.

CLI commands allow you to automate testing or array creation in a production environment using Windows command scripts and Linux and Unix shell scripts.

This appendix describes briefly some of the commands available in the CLI. For a full description of all the CLI commands, refer to the *Command Line Interface Reference Guide*.

Terminology

This section discusses terminology used in this *Appendix*.

Adaptec 2410SA/2810SA Controllers Only

In the device ID format `C:ID:L`:

■ C represents Channel, which is always zero.

■ ID represents Port ID, or Port number, on the SATA RAID controller. This is the only value that is used.

■ L represents LUN, which is always zero.

> **Note:** Only the value for Port ID is used.

Adaptec 21610SA Controllers Only

In the device ID format `C:ID:L`:

■ C represents Channel.
■ ID represents Port ID. (For mapping, see below.)
■ L represents LUN, which is always zero.

Your Serial ATA adapter maps Port IDs as follows:

■ Controller ports 0 through 7 are mapped to IDs 0 through 7 on Channel 0

■ Controller ports 8 through 15 are mapped to IDs 0 through 7 on Channel 1

For example, port 5 is 0:5:0; port 12 is 1:4:0.

All Controllers

The following terms are used in discussing the CLI:

- **Array, container**—A logical disk created from available space and made up of one or more partitions on one or more physical disks.

- **Stripe, chunk**—Contiguous set of data distributed across all the disks in an array. A striped array distributes data evenly across all members in equal-sized sections called *stripes*.

- **Free or available space**—Space on an initialized disk that is not in use.

- **Partition**—Contiguous area of a physical drive that makes up some or all of an array.

- **Hotspare, failover disk**—A hard drive, an array member, that is not used in day-to-day data storage, but is instead reserved for use as a replacement for one of the other drives in the array in the event of a failure.

Additional RAID terms are defined in the *Glossary*.

Accessing the CLI

The method you use to access the CLI depends on the operating system (OS), as described below.

Accessing the CLI in MS-DOS

To access the CLI from the MS-DOS prompt, move to the directory containing the afacli executable, then type afacli.

Accessing the CLI in Windows

To access the CLI:

> **Note:** The following procedure assumes that you accepted the default location for the software during installation.

1 Click the **Start** button.

2 Click **Programs**.

3 Browse to **Adaptec Storage Manager**.

The Adaptec program group is displayed.

4 Click **CLI**.

> **Note:** In Windows, when the CLI executes a background command, it displays status information in the title bar of a DOS command prompt window. The status information includes a percentage indicating a level of completion.

Accessing the CLI in Unix

To access the CLI, display a window and type aaccli in any directory. When the system displays the CLI> prompt, you can use CLI commands. The status information appears at the bottom of the CLI window.

For the commands to work in any directory, the path in the startup file (.login or .cshrc) must include the directory where the software is installed. Refer to your OS documentation for information on setting up directory paths in the .login and .cshrc files.

From the NetWare server console

To access the CLI from the NetWare server console, type `aaccli` at the prompt. When the system displays the `CLI>` prompt, which indicates that you can now use CLI commands.

Using the CLI

This section contains some examples of using CLI commands to perform common tasks.

Opening and Closing a Controller

To prepare a controller to receive a CLI command, you first need to *open* the controller. You may open only one controller at any time.

To open controller AAC0 and prepare it to receive more CLI commands, type:

```
CLI> open AAC0
```

The prompt changes to reflect the open controller, as shown in the next example. When you have finished with the controller, close it by typing:

```
AAC0> close
```

Displaying Information about Your Disks

Before creating any array, use the `disk show space` command to display information about your disks.

> **Note:** Before you can create arrays, you need to initialize the member drives.

In the following example, the **Usage** column indicates **Free** for each disk, which means that the space on each disk consists of available space.

```
AAC0> disk show space
Executing: disk show space
Scsi C:ID:L Usage       Size
----------- ---------- ------------
     0:01:0 Free       64.0KB:8.47GB
     0:02:0 Free       64.0KB:8.47GB
     0:03:0 Free       64.0KB:8.47GB
     0:04:0 Free       64.0KB:8.47GB
```

Displaying Information about Your Array

After creating an array, use the `container list` command to display information about the array. In the following example, the `Num Label` column indicates the array ID 0 and the array label Venus. The `Type` column indicates a volume set. The `Total Size` column indicates that the array is 100 MB.

```
AAC0> container list
Executing: container list
  Num        Total  Oth Stripe        Scsi    Partition
DrLabel Type  Size   Ctr Size  Usage  C:ID:L  Offset:Size
-- ----- ------ ------ --- ------ ------- ------ -----------
    0     Volume 100MB            None  0:01:0 64.0KB: 100MB
   Venus
```

Creating a Volume Set

To create a volume set, use the `container create volume` command. In the following example, Volume 0 is created on device `0:01:0` from 100 MB (megabytes) of available space. The array's cache is enabled, and the label is Venus.

```
AAC0> container create volume /cache=TRUE /label=Venus ((0,01,0), 100M)
Executing: container create volume /cache=TRUE /
label=Venus ((CHANNEL=0,ID=1,LUN=0),104,857,600)
container 0 created
```

Creating a RAID 0

When creating a RAID 0, you need to determine the stripe size that is most suitable for your environment. The `stripe_size` attribute indicates the number of bytes in a stripe, the amount of data written to a partition before the I/O data stream switches to the next partition in the array.

The stripe size can be 16, 32, or 64 KB; the default is *64 KB*. Note that you can change the stripe size later using the `container reconfigure` command.

To create a RAID 0, use the `container create stripe` command. In the following example, the Array `0` is created on device `0:01:0` from 100 MB of available space. The array's cache is enabled, and the label is Mars.

```
AAC0> container create stripe /cache=TRUE /label=Mars ((0,01,0), 100M)
Executing: container create stripe /cache=TRUE
/label="Mars" ((CHANNEL=0,ID=1,LUN=0),104,857,600 )
container 0 created
```

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Creating a RAID 1

To create a RAID 1, use the `container create new_mirror` command. In the following example, a RAID 1 is created on devices `0:02:0` and `0:03:0` using 100 MB of available space from each device.

```
AAC0> container create new_mirror ((0,2,0), 100M) (0,3,0)
Executing: container create new_mirror ((CHANNEL=0,ID=2,LUN=0),104,857,600 )
(CHANNEL=0,ID=3,LUN=0)
```

Creating a RAID 5

When you create a RAID 5, you use a form of redundancy called parity. When you set up parity, the parity stripes are initialized, by default, using a scrub switch (`/scrub=TRUE`). Parity is set up in the background, and the disks are available immediately.

> **Linux/UNIX only:** The `/scrub` switch is not available in Linux. For Linux, the RAID 5 is always created by building.

The stripe size can be 16, 32, or 64 KB; the default is *64 KB*. Note that you can change the stripe size later using the `container reconfigure` command.

To create a RAID 5, use the `container create raid5` command. In the following example, a RAID 5 is created on devices `0:01:0`, `0:02:0`, and `0:03:0` using 100 MB of available space from each device:

```
AAC0> container create raid5 /stripe_size=64K ((0,1,0), 100M) (0,2,0) (0,3,0)
Executing: container create raid5 /stripe_size=65,536
((CHANNEL=0,ID=1,LUN=0),104,857,600) (CHANNEL=0,ID=2,LUN=0)
(CHANNEL=0,ID=3,LUN=0)
```

Deleting an Array

To delete an array, use the `container delete` command. In the following example, Array 0 is deleted.

```
AAC0> container delete 0
Executing: container delete 0
```

After running the `container delete` command, use the `container list` command to verify that the array was deleted. In the following example, no arrays are found on the controller.

```
AAC0> container list
Executing: container list
No containers found.
```

Managing Failover Options and Hotspares

To assign one or more hotspares to a single array, use the `container set failover` command. To assign one or more spare disks for all arrays, use the `container set global_failover` command. These commands allow you to add hotspares to an array prior to a drive failure so that the array contains the resources it needs to survive a failure.

Alternatively, you can use the automatic failover commands that allow you to remove a failed drive and add a hotspare in its place. The controller automatically assigns the new hotspare to replace the failed drive without your having to first assign it using the `container set failover` or `container set global_failover` commands.

> **Note:** Automatic failover works only with disks that reside in an SAF-TE- or SES-enabled enclosure.

> **Caution:** During hotspare assignment, all data is deleted from the hotspare.

The following failover topics are discussed:

■ *Displaying the Controller's Automatic Failover Status*

■ *Enabling Automatic Failover*

Displaying the Controller's Automatic Failover Status

To display a controller's automatic failover status, use the `controller show automatic_failover` command. In the following example, automatic failover is `DISABLED`:

```
AAC0> controller show automatic_failover
Executing: controller show automatic_failover
Automatic failover DISABLED
```

Enabling Automatic Failover

To enable automatic failover, use the `controller set automatic_failover` command with the `/failover` switch, as in the following example:

```
AAC0> controller set automatic_failover
/failover_enabled=TRUE
Executing: controller set automatic_failover
/failover_enabled=TRUE
```

After running the `controller set automatic_failover` command, use the `controller show automatic_failover` command to verify that automatic failover has been enabled. If necessary, you can now replace a failed disk with a replacement disk.

Displaying Controller Information

Controllers exhibit a number of attributes that you can display or manage using the following CLI commands:

■ *Controller List*

■ *Controller Details*

Controller List

The `controller list` attributes are defined as follows:

■ `Adapter Name`—Name

■ `Adapter Type`—Product name

■ `Controller Availability`—Access mode

Example

Before opening a controller, you may want to use the `controller list` command to display all controllers. In the following example, the `Adapter Name` column indicates that `AAC0` is the name of the controller installed on the computer. The example also indicates the controller's path (\\.\).

```
CLI> controller list
Executing: controller list
Adapter Name    Adapter Type    Availability
------------    -----------     -----------
\\.\AAC0        Adaptec xxxxx   read/write
```

Controller Details

The `controller details` attributes are defined as follows:

- `Controller Name`—Name

- `Controller Type`—Product name

- `Controller Availability`—Access mode

- `Controller Remote Computer`—Name of the remote computer on which an open controller resides

- `Controller Serial Number`—Last six hexadecimal characters of the serial number

- `Controller CPU Type`—CPU

- `Number of Channels`—Number of channels

- `Number of Devices Per Channel`—Maximum number of devices, not including the host controller

- `Controller CPU Speed`—Clock speed (in MHz)

- `Controller Memory`—Total amount of available memory for applications and data

Example

```
AAC0> controller details
Executing: controller details
Controller Information
---------------------
        Remote Computer: .
            Device Name: AAC0
        Controller Type: Adaptec xxxxxx
            Access Mode: READ-WRITE
Controller Serial Number: Last Six Digits = 8A277A
        Number of Buses: 2
         Devices per Bus: 15
         Controller CPU: i960
    Controller CPU Speed: 100 Mhz
       Controller Memory: 64 Mbytes
          Battery State: Not Present
Component Revisions
---------------------
               CLI: 3.0-0 (Build #5478)
               API: 3.0-0 (Build #5478)
    Miniport Driver: 3.0-0 (Build #5478)
Controller Software: 3.0-0 (Build #5478)
    Controller BIOS: 3.0-0 (Build #5478)
Controller Firmware: (Build #5478)
Controller Hardware: 3.3
```

Displaying Disk Information

The CLI allows you to monitor or manage disk attributes, prepare a disk for use by a controller, and detect defects using the following commands:

■ *Disk List*

■ *Disk Show Defects*

■ *Disk Verify*

Disk List

The disk list attributes are defined as follows:

■ Device ID—An ID number assigned to each device attached to a channel

■ Device Type—Reports whether the device is a disk, printer, scanner, and so on

■ Removable Media—Reports whether the media is removable (floppy disk or CD-ROM, for example)

■ Vendor ID—Name of a device vendor

■ Product ID—Device model number

■ Revision Number—Device revision number

■ Number of Blocks—Total number of disk block available on a device

■ Bytes per Block—Number of bytes for each block

■ Disk Usage—Either MS-DOS, Initialized, Not Initialized, Offline, or Unknown

■ Shared Channel—N/A

Example

```
AAC0> disk list
Executing: disk list
C:ID:L Device Type Blocks   Bytes/Block Usage       Shared
------ ----------- -------- ----------- ----------- ------
0:01:0 Disk        17783240 512         Initialized NO
0:02:0 Disk        17783240 512         Initialized NO
```

Disk Show Defects

The disk show defects command shows the following types on information:

■ Total number and location of primary defects (defects that originate during manufacturing)

■ Total number and location of grown defects (defects that originate after manufacturing)

Example

In the example below, the drive contains five primary defects and no grown defects:

```
AAC0> disk show defects /full=true (0,1,0)
Executing: disk show defects /full=TRUE (CHANNEL=0,ID=1,LUN=0)
Number of PRIMARY defects on drive: 5
Defect 1 at cylinder 229, head 7, sector 203
Defect 2 at cylinder 575, head 0, sector 219
Defect 3 at cylinder 576, head 0, sector 55
Defect 4 at cylinder 578, head 0, sector 238
Defect 5 at cylinder 579, head 0, sector 74
Number of GROWN defects on drive: 0
```

Disk Verify

The disk verify command shows the following types on information:

■ Total number and location of primary defects (defects that originate during manufacturing)

■ Total number and location of grown defects (defects that originate after manufacturing)

Displaying Array Information

The CLI allows you to display and manage array attributes using the following commands:

■ *Container List*

■ *Container Show Cache*

Container List

The container list attributes are defined as follows:

■ Drive Letter—Letter associated with an array. Not automatically assigned when you create an array.

- `Root Special File` (Unix/Linux only)—File associated with the array and created by the OS after array creation. Appears in the Num Label column.

- `Array Number`—ID of an array (0 to 63).

- `Array Label`—Name assigned to an array. Not automatically assigned. Appears in the Num Label column.

- `Array Type`—Defines an array as a volume, RAID 0, RAID 1, etc., or a reconfigured array.

- `Creation Date`—Month, day, and year the array was created.

- `Creation Time`—Hour, minute, and second the array was created.

- `Total Size`—Number of bytes in an array. The size of an array is the size of the available space when the array was created, reconfigured, or extended.

- `Stripe Size`—Number of bytes in a stripe (amount of data written to a partition before the I/O data stream switches to the next partition/array).

- `Read Only`—Reports whether an array is read-only accessible. An array can be set to read-only if not in use by an application.

- `Read/write`—Reports whether an array is read-write accessible.

- `Lock`—Reports whether an array is locked into volatile memory space on the currently open controller.

- `Resident File System`—Type of file system, if any, that resides on an array. Appears in the Usage column.

- `Multipartition Container`—That a file system resides on a multipartition array. Appears in the Usage column.

- `UNIX opened`—There is a mounted file system on the array.

- `Unknown File System`—There is an unknown file system on the array.

- `Unmapped Containers`—The array is unusable and cannot be mounted.

- `Phantom Container`—The RAID controller software cannot configure the array or the array is offline.

- `Valid Container`—The OS recognized the array and there has been a query (such as mount, fdisk, read, or write) on the array.

■ `Mirror Set Create`—Creation of a RAID 1 (mirror).

■ `Mirror Set Normal`—The RAID 1 is in the normal state.

■ `Reconfiguration Copy Container`—An array is being used as a copy (hidden) array (Copy).

■ `Reconfiguration Destination Container`—An array is being used as a destination (hidden) array (Dest).

■ `Reconfiguration RAID 5 Set`—An array is being used as a RAID 5 (hidden array).

■ `Reconfiguration Source Container`—An array is being used as a source (hidden) array.

■ `Reconfiguration Temporary Container`—An array is being used as a temporary (or hidden) array (Temp).

■ `RAID 5 Set Unprotected`—Creation of a RAID 5 (Unprot).

Example

```
AAC0> container list
Executing: container list
        Total  Oth Stripe            Scsi   Partition
Label Type  Size  Ctr Size   Usage   C:ID:L Offset:Size
----- ----- ----- --- ------ ------- ----- ------------
0     Volume 30MB             None    0:01:0 64KB: 15MB
Venus                                 02    64KB: 15MB
```

Container Show Cache

The `container show cache` attributes are defined as follows:

■ `Global Container Read Cache Size`—Number of blocks dedicated to the read cache.

■ `Global Container Write Cache Size`—Number of blocks dedicated to the write cache.

■ `Read Cache Setting`—Reports whether the read cache is enabled.

Example

```
AAC0> container show cache 0
Executing: container show cache 0
Global container Read Cache Size  : 5345280
Global container Write Cache Size : 63332352
Read Cache Setting     : ENABLE
Write Cache Setting    : ENABLE
Write Cache Status     : Active, cache enabled
```

CLI Command Dictionary

This section contains a command reference for the following command groupings:

- *General Control Commands*
- *Container (Array) Commands*
- *Controller Commands*
- *Disk Commands*
- *Logfile Commands*
- *Task Commands*
- *Enclosure Commands*

General Control Commands

`close`

Closes the currently opened controller.

`exit`

Closes the opened controller and exits the CLI.

`help [/full] [{command}]`

Invokes general or topical help.

Parameters

{command}—If a command has more subcommands, `help` lists the subcommands and their functions. If a complete command is used, such as `container list`, the `help` displays all possible switches.

Switches

/full—Displays all relevant commands along with the command format and all command switches.

`history_size {buffer_size}`

Linux/Unix only—Sets the size of the history buffer.

Parameters

{buffer_size}—Size of the command history buffer. The default is *200*.

```
open [/readonly={boolean}] [/domain={string}] {name}
```

Opens a controller, a prerequisite for any controller command to be used on that controller.

Parameters

`{name}`—Computer name and the controller to open.

Switches

`/readonly`—If *TRUE*, the controller is opened for read-only access. (The default is *FALSE*.) If you open a controller with read-only access, you can use only those commands that do not change the controller configuration.

`/domain` *(Windows only)*—Local or trusted domain in which the host system resides. The default is the local domain.

```
reset_window
```

Linux/Unix only—Resets the window.

Container (Array) Commands

Before working with arrays, you must have previously opened the controller. In addition, you must have initialized your disks to prepare for array operations.

Use the Container commands to display, create, and manage arrays.

```
container add_level {container}
```

Creates a multilevel volume array which contains the array as its only element.

Parameters

`{container}`—ID number of the array to convert to a multilevel volume.

```
container clear [/always={boolean}] [/wait={boolean}]
  {container}
```

Clears the array.

Parameters

`{container}`—ID number of the array to clear.

Switches

/always—Specifies whether to clear the array even if it has data on it. The default is *FALSE*, meaning that the command clears the array only if it has no data on it. All user files must be closed; the /always switch cannot override this restriction.

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
container create mirror [/wait={boolean}]
   [/io_delay={integer}] {container} {device_ID}
```

Creates a RAID 1 from a single entry volume.

Parameters

{container}—ID number of the array on which to create a RAID 1 (mirror).

{device_ID}—ID for the device whose available space to use for mirroring the volume is specified by the {container} parameter.

Switches

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

/io_delay—Number of milliseconds between each I/O used for the RAID 1 creation.

```
container create mmirror [/io_delay={integer}]
   [/wait={boolean}] {container} {device_ID} [{device_ID}...]
```

Creates a multilevel array of RAID 1 arrays from a multilevel array of single entry volumes.

Parameters

{container}—ID number of the array whose underlying volumes the command converts to RAID 1 arrays.

{device_ID}—ID for the device whose available space to be used to create the multilevel array of RAID 1 arrays.

Switches

/io_delay–Number of milliseconds between each I/O used for the RAID 1 create.

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
container create mstripe [/stripe_size={integer}]
   [/label={string}] {container} [{container}...]
```

Creates a multilevel RAID 0 (stripe).

Parameters

{container}—ID number of the array from which to create the multilevel RAID 0.

Switches

/stripe_size—Stripe size for the RAID 0 array.

/label—Label for the RAID 0 array.

```
container create mvolume {container} [{container}...]
```

Creates a multilevel volume.

Parameters

{container}—ID number of the array from which to create the multilevel volume.

```
container create new_mirror [/cache={boolean}]
   [/clear={boolean}] [/label={string}]
   [</quick_init={boolean}>] [/scrub={boolean}]
   [/wait={boolean}] {free_space} [{device_ID}...]
```

Creates a RAID 1 (mirror) from two available spaces.

> **Note:** For details, see `container create raid5` below.

```
container create raid5 [/cache={boolean}]
   [/stripe_size={integer}] [/clear={boolean}]
   [/label={string}] [</quick_init={boolean}>]
   [/scrub={boolean}] [/wait={boolean}] {free_space}
   [{device_ID}...]
```

Creates a RAID 5.

Parameters

{free_space}—Drive and its associated available space used to create the array.

{device_ID}—One or more devices whose available space to be used to create the array.

Switches

/cache—Specifies whether to enable the array's cache.

/stripe_size—Stripe size for the RAID 5 array.

/clear—Specifies whether to clear the entire array during initialization.

/label—Label to assign to the newly created array.

/quick_init—Specifies to use the Quick Init process, making the array available immediately.

/scrub—Specifies whether to set up the parity by building.

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
container create stripe [/cache={boolean}]
   [/stripe_size={integer}] [/label={string}]
   {free_space} [{device_ID}...]
```

Creates a RAID 0.

Parameters

{free_space}—Drive and its associated available space to be used to create the RAID 0.

{device_ID}—One or more devices.

Switches

/cache—Specifies whether to enable caching on the array.

/stripe_size—Stripe size for the RAID 0. The default is *64 KB*.

/label—Label to assign to the new RAID 0.

```
container create volume [/cache={boolean}]
   [/label={string}] {device_ID}, {free_space},
   {device_ID}, [{free_space}...]
```

Creates a volume.

Parameters

{device_ID}—Drive and its associated available space to be used to create the volume.

{free_space}—Available space to be used to create the volume.

{device_ID}, {free_space}—Additional devices and associated available spaces.

Switches

/cache—Specifies whether to enable caching on the array.

/label—Label to assign to the new volume.

```
container delete [/always={boolean}]
   [/unconditional={boolean}] {container}
```

Deletes the array.

Parameters

{container}—ID number of the array to delete.

Switches

/always—Specifies that the array be deleted if it has data a file system. (Cannot override open files.)

/unconditional—Specifies that the array be deleted even if it has a file system. (Overrides open files.)

```
container list [/all={boolean}] [/full={boolean}]
   [{container}]
```

Lists information about the arrays on the controller.

Parameters

{container}—ID number of the array containing information to display.

Switches

/all—Specifies whether to list all containers on the system.

/full—Specifies whether to display detailed information.

```
container move {container1} {container2}
```

Moves the first array number specified to the second array number specified; in effect, to renumber an array.

Parameters

{container1}—ID number of the array to renumber.

{container2}—ID number to assign to the array specified in container1.

```
container promote {container}
```

Creates a multilevel volume from a RAID 0 or a single entry volume.

Parameters

{container}—ID number of the array to promote to a multilevel array.

```
container readonly {container}
```

Sets the protection on the array to read-only access.

Parameters

{container}—ID number of the array to set to read-only access.

```
container readwrite {container}
```

Sets the protection on an array to read-write access.

Parameters

{container}—ID number of the array to set to read-write access.

```
container reconfigure [/stripe_size={integer}]
   [/mirror={boolean}] [/partition_move={boolean}]
   [/partition_size={integer}] [/raid5={boolean}]
   [/raid10={boolean}] [/restart={boolean}]
   [/stripe={boolean}] [/volume={boolean}]
   [/wait={boolean}] {container} [{device_ID}...]
```

Changes the configuration of an array.

Parameters

{container}—ID number of the array to reconfigure.

{device_ID}—One or more devices.

Switches

/stripe_size—Stripe size of the array.

/mirror—Reconfigure the array as a RAID 1.

/partition_move—Specifies that the array will move partitions instead of add extra space.

/partition_size—Size of a partition.

/raid5—Reconfigure the array as a RAID 5.

/raid10—Reconfigure the array as a RAID 10 (stripe of mirrors).

/restart—Restart reconfiguring the array.

/stripe—Reconfigure the array as a RAID 1.

/volume—Reconfigure the array as a volume.

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
container remove failover {container} {device_ID}
   [{device_ID}...]
```

Removes one or more failover disks.

Parameters

{container}—ID number of the array whose assigned failover disk is to be removed.

{device_ID}—ID for the device to remove as a failover disks.

```
container remove global_failover {device_ID}
  [{device_ID}...]
```

Removes a global failover assignment.

Parameters

{device_ID}—ID for the device to remove as a failover disk.

```
container restore RAID5 {container}
```

Tries to restore a RAID 5 that has a number of dead partitions as members.

Parameters

{container}—ID number of the RAID 5 to restore.

```
container scrub [/io_delay={integer}]
  [/no_repair={boolean}] [/wait={boolean}] {container}
```

Checks and repairs the consistency of a redundant array.

Parameters

{container}—ID number of the redundant array to build.

Switches

/io_delay—Number of milliseconds the controller waits between I/Os when building the array.

/no_repair—Specifies whether the build operation be performed without repairing the error.

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
container set cache [/read_cache_enable={boolean}]
   [/unprotected={boolean}] [/write_cache_enable={boolean}]
   {container}
```

Sets cache parameters for a specific array. Useful only if a native OS's file system resides on the array.

Parameters

`{container}`—ID number of the array on which to set cache parameters.

Switches

`/read_cache_enable`—Specifies whether to enable the read-ahead cache.

`/unprotected`—Specifies whether to set the container's NVRAM write-back cache to disable, enable when protected, or enable always. Use this switch in conjunction with the `/write_cache_enable` switch.

`/write_cache_enable`—Specifies whether to set the container's NVRAM write-back cache to disable, enable when protected, or enable always. Use this switch in conjunction with the `/unprotected` switch.

```
container set failover {container} {device_ID}
   [{device_ID}...]
```

Assigns an automatic failover disk for a single array.

Parameters

`{container}`—ID number of the array on which to assign an automatic failover disks.

`{device_ID}`—ID for the device to assign as a failover disk.

```
container set global_failover {device_ID} [{device_ID}...]
```

Assigns an automatic failover disk for all arrays.

Parameters

`{device_ID}`—ID for the device to assign as a failover disk.

```
container set io_delay {container} {integer}
```

Sets the I/O delay (in milliseconds).

Parameters

`{container}`—ID number of the array on which to set the I/O delay.

`{integer}`—Number of milliseconds the controller waits between I/O operations.

`container set label {container} {label}`

Assigns a new label to the array.

Parameters

`{container}`—ID number of the array to which to assign a label.

`{label}`—Specifies the label to assign.

`container show cache {container}`

Displays caching parameters for an array.

Parameters

`{container}`—ID number of the array whose associated cache parameters to display.

`container show failover [{container}]`

Displays an array's assigned failover disks.

Parameters

`{container}`—ID number of the array whose assigned failover disks to display.

`container unmirror {container}`

Changes the RAID 1 (mirror) to a volume and frees the redundant space.

Parameters

`{container}`—ID number of the RAID 1 to unmirror.

Controller Commands

Use the Controller commands to display the status of a variety of controller attributes and to perform such tasks as pausing or resuming I/O, and enabling or disabling automatic failover.

```
controller details
```

Shows details about the open controller and software.

```
controller firmware compare [/C{controller}]
   [{controller}...] [/D{UFI_file_path}]
```

Compares the contents of each of the flash components on a controller to the corresponding image in User Flash Image (UFI) files and indicates whether they match.

Switches

`/C{controller}`—ID representing the set of controllers on which to perform the firmware comparison.

`/D{UFI_file_path}`—Location of the UFI files.

```
controller firmware save [/C{controller}]
   [{controller}...] [/D{UFI_file_path}]
```

Saves the contents of a controller's flash in User Flash Image (UFI) files.

Switches

`/C{controller}`—ID representing the set of controllers on which to perform the firmware comparison.

`/D{UFI_file_path}`—Location of the UFI files.

> ✎ **Note:** This command is not supported in Linux.

```
controller firmware update [/C{controller}]
   [{controller}...] [/D{UFI_file_path}]
```

Updates a controller's flash components from the flash image data in a pair of User Flash Image (UFI) files.

Switches

`/C{controller}`—ID representing the set of controllers on which to perform the firmware comparison.

`/D{UFI_file_path}`—Path where the pair of UFI files are located.

```
controller list [/domain={string}] [{string}]
```

Lists all controllers or displays information about the currently opened controller.

Parameters

{name}—Computer name from which to display all controllers or specific information about the open controller.

Switches

/domain (*Windows only*)—Specifies the domain in which the host to be searched resides.

```
controller pause_io [{integer}]
```

Windows only—Pauses all I/O activity on the open controller to allow online manipulation of hardware.

Parameters

{integer}—Time in seconds to cause the controller to wait before resuming I/O.

```
controller rescan
```

Rescans the channels and updates all underlying structures.

```
controller reset_channel {integer}
```

Resets a specific channel on the open controller.

Parameters

{integer}—Channel on which to reset this channel.

```
controller resume_io
```

Performs rescan operation, then resumes I/O after pause_io.

```
controller set automatic_failover [/failover_enabled={boolean}]
```

Turns on or off automatic failover for the controller.

Switches

/failover_enabled—Specifies whether to turn on or off automatic failover on the controller. Specify 1 to enable, 0 to disable. The default is 0.

```
controller set container_verify [/verify_enabled={boolean}]
```

Turns the container verify task on or off.

Switches

`/verify_enabled`—Specifies whether to turn on or off the container verify feature. The default is TRUE, which means the command turns on the container verify feature.

```
controller show automatic_failover
```

Displays the automatic failover status (enabled or disabled) for the controller.

```
controller show channels
```

Displays all of the channels on the controller with the characteristics of each channel.

```
controller show container_verify
```

Displays the status of the container verify status.

Disk Commands

Use the `disk` commands to manage disks connected to a RAID controller. The CLI allows you to monitor disk characteristics and parameters, prepare a disk for use, and detect defects.

```
disk blink {device_ID} {integer}
```

Causes the disk access light to blink.

Parameters

`{device_ID}`—ID number of the device to blink.

`{integer}`—Number of seconds for the disk to blink. A value of zero stops the blinking.

```
disk initialize [/always={boolean}]
    [/unconditional={boolean}] {device_ID}
```

Initializes a disk on the currently opened controller.

Parameters

`{device_ID}`—ID number of the device to initialize,

Switches

/always—Specifies whether to initialize the disk even if the disk has existing data. (Cannot override open files.) The default is *FALSE*.

/unconditional—Specifies whether to initialize the disk even if arrays on the disk have open files. The default is *FALSE*.

```
disk list [/all={boolean}] [/full={boolean}] [{device_ID}]
```

Lists the disks available on the controller.

Parameters

{device_ID}—ID number of the device to display information.

Switches

/all—List of all devices on the controller.

/full—Detailed information for devices. The default is *FALSE*.

```
disk remove dead_partitions {device_ID}
```

Removes all failed partitions from a disk.

Parameters

{device_ID}—ID number of the device from which to remove failed partitions.

```
disk set default {device_ID}
```

Sets the default ID for use in CLI commands.

Parameters

{device_ID}—ID number of the device.

```
disk set smart [/all={boolean}] [/clear={boolean}]
   [/enable_exceptions={boolean}][/logerr={boolean}]
   [/perf={boolean}] [/report_count={boolean}]
   [{device_ID}]
```

Changes a disk's Self-Monitoring, Analysis and Reporting Technology (SMART) configuration.

Parameters

{device_ID}—ID number of the device on which to change SMART configurations.

Switches

/all—Specifies whether to enable SMART configurations for all disks.

/clear—Clears the SMART error counts for the disk.

/enable_exceptions—Specifies whether to enable SMART exception reporting.

/logerr—If *FALSE* (the default), logging of SMART exception reports is dissabled. If *TRUE*, logging of SMART exception reports is enabled.

/perf—If *FALSE* (the default), reporting of exceptions according to the MRIE mode is dissabled. If *TRUE*, reporting of exceptions according to the MRIE mode is enabled.

/report_count—Number of times an exception can be reported. A value of zero indicates no limit.

```
disk show default
```

Displays the current default for the device ID.

```
disk show defects [/full={boolean}] {device_ID}
```

Shows the number of defects and the defect list for a specific drive.

Parameters

{device_ID}—ID number of the device.

Switches

/full—Specifies whether to display the defect count and defects.

```
disk show partition
```

Displays all partitions on the disks attached to the currently opened controller.

```
disk show smart [/all={boolean}] [/full={boolean}]
   [/view_changeable={boolean}] {device_ID}
```

Displays Self-Monitoring, Analysis and Reporting Technology (SMART) configuration information for one or all disks.

Parameters

{device_ID}—ID number of the device for which to display SMART information.

Switches

/all—Specifies whether to display SMART configurations for all disks.

/full—Specifies whether to display detailed SMART configuration information for one or all disks.

/view_changeable—Specifies whether to display the configuration information that can be set on a SMART disk.

```
disk show space [/all={boolean}] [{device_ID}]
```

Displays space usage information.

Parameters

{device_ID}—ID number of the device for which to display space usage information.

Switches

/all—Specifies whether to display all space usage.

```
disk verify [/repair={boolean}] [/wait={boolean}]
   {device_ID}
```

Verifies all blocks on a device and, optionally, repairs any bad blocks.

Parameters

{device_ID}—ID number of the device to verify.

Switches

/repair—If *FALSE* (the default), the command only reports failures. If *TRUE*, bad blocks are automatically repaired, if possible.

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

```
disk zero [/repair={boolean}] [/wait={boolean}]
   {device_ID}
```

Clears an entire disk (by writing zeros). All data is erased and cannot be recovered.

Parameters

{device_ID}—ID number of the device to clear.

Switches

/repair—If *FALSE* (the default), the command only reports failures. If *TRUE*, bad blocks are automatically repaired, if possible.

/wait— If *FALSE* (the default), the operation is performed in the background and the command prompt is returned immediately. If *TRUE*, the operation is performed immediately and the command prompt is returned only when done.

Logfile Commands

```
logfile end
```

Ends logging of all output and closes the log file.

```
logfile start [/append={boolean}] {file}
```

Begins logging of all CLI command line activity to a file.

Parameters

{file}—Name of log file.

Switches

/append—Specifies whether to append all CLI command line activity to an existing output file if one exists.

Task Commands

Use the CLI commands to display and manage tasks. A task is an operation that occurs only on the controller, asynchronous to all other operations. Examples of tasks are clearing a disk and creating a RAID 1. Once a task is running on the controller, the CLI allows you to display, stop, suspend, and resume the task.

```
task list [/all={boolean}] [{integer}]
```

Lists the tasks running on the controller.

Parameters

`{integer}`—Task ID.

Switches

`/all`—Specifies whether to list all currently running tasks.

```
task resume [/all={boolean}] {integer}
```

Resumes a task that was suspended or all of the tasks that were suspended.

Parameters

`{integer}`—Task ID for the task to resume.

Switches

`/all`—Specifies whether to resume all suspended tasks.

```
task stop [/all={boolean}] [{integer}]
```

Stops one or all tasks on the controller.

Parameters

`{integer}`—Task ID for the task to stop.

Switches

`/all`—Specifies whether to stop all suspended tasks.

```
task suspend [/all={boolean}] [{integer}]
```

Suspends one or all tasks running on the controller.

Parameters

`{integer}`—Task ID for the task to suspend.

Switches

`/all`—Specifies whether to suspend all running tasks.

Enclosure Commands

> ✓ **Note:** You can use the `enclosure` commands only with
> enclosures that support Version 1.0 of the SAF-TE specification.

```
enclosure activate slot {enclosure} {slot}
```

Activates a device in a slot in the SAF-TE enclosure.

Parameters

`{enclosure}`—ID number of the enclosure management device
on which to activate a device.

`{slot}`—Unit number of the slot.

```
enclosure identify slot [/stop={boolean}] {enclosure}
   {slot}
```

Identifies a device in the enclosure.

Parameters

`{enclosure}`—ID number of the enclosure management device
on which to identify a slot.

`{slot}`—Unit number of the slot.

Switches

`/stop`—Specifies whether to stop identifying the slot.

```
enclosure list [/all={boolean}] [/full={boolean}]
   [{enclosure}]
```

Lists components for one or all enclosure devices.

Parameters

`{enclosure}`—ID number of the enclosure management device
whose associated components to display.

Switches

`/all`—Lists all enclosures on the system.

`/full`—Displays detailed component information.

```
enclosure prepare slot {enclosure} {slot}
```

Prepares a device in a slot for insertion or removal.

Parameters

{enclosure}—ID number of the enclosure management device on which to prepare a slot.

{slot}—Unit number of the slot.

```
enclosure set alarm [/on={boolean}] {enclosure}
```

Turns the audible alarm on or off.

Parameters

{enclosure}—ID number of the enclosure management device whose audible alarm to set.

Switches

/on—Specifies whether to turn the audible alarm on or off.

```
enclosure set fan [/off={boolean}] {enclosure} {fan} [{speed}]
```

Sets the speed of a specific fan.

Parameters

{enclosure}—ID number of the enclosure management device on which to set the speed of a fan.

{fan}—Unit number of the fan.

{speed}—Speed at which to set the fan.

Switches

/off—Specifies whether to turn off the fan.

```
enclosure set interval {second}
```

Sets the monitor reporting interval (in seconds).

Parameters

{second}—Number of seconds for the monitor reporting interval.

```
enclosure set power [/off{=boolean}] {enclosure}
   {powersupply}
```

Turns on or off a specific power supply.

Parameters

{enclosure}—ID number of the enclosure management device.

{powersupply}—Unit number of the power supply.

Switches

/off—Specifies whether to turn on or off the power supply of the unit number.

enclosure set scsiid {enclosure} {slot} {device_ID}

Sets the ID number of the device slot.

Parameters

{enclosure}—ID number of the enclosure management device.

{slot}—Unit number of the device slot to assign a channel number.

{device_ID}—ID number of the device.

enclosure set temperature {enclosure} {degree}

Sets the temperature threshold.

Parameters

{enclosure}—ID number of the enclosure management device on which to set a temperature threshold.

{degree}—Temperature (in degrees Fahrenheit from 0 to 255).

enclosure show fan [{enclosure}] [{fan}]

Displays the status of a specific fan.

Parameters

{enclosure}—ID number of the enclosure management device for which to display fan status.

{fan}—Unit number of the fan.

enclosure show power [{enclosure}] [{powersupply}]

Displays the status of one or more power supplies.

Parameters

{enclosure}—ID number of the enclosure management device for which to display power supply status.

{powersupply}—Unit number of the power supply.

enclosure show slot [{enclosure}] [{slot}]

Displays the status of a specific device slot on a specific enclosure.

Parameters

{enclosure}—ID number of the enclosure management device for which to display device slot status.

{slot}—Unit number of the device slot whose status to display.

enclosure show status [{enclosure}]

Displays general status of a specific enclosure.

Parameters

{enclosure}—ID number of the enclosure management device for which to display status.

enclosure show temperature [{enclosure}] [{sensor}]

Displays temperature status of a specific enclosure.

Parameters

{enclosure}—ID number of the enclosure management device for which to temperature status.

{sensor}—Unit number of the temperature sensor whose status to display.

Using Automated Command Scripts

To execute a CLI command script, type the at sign (@), followed by the filename that contains the CLI commands, for example:

```
AAC0>@commandscript.txt
```

In a CLI command script text file, each line ends with a line feed inserted by pressing **Enter**.

Example

```
open AAC0
controller details
close AAC0
exit
```

The above CLI command script:

1 Opens controller AAC0 by invoking the CLI command open.

2 Invokes controller details.

3 Closes controller AAC0 by invoking the CLI command close.

4 Exits the script.

E

About RAID

A RAID (Redundant Array of Independent Disks) provides better performance and reliability from combinations of drives than is possible with the same total storage space without RAID.

This *Appendix* describes the various RAID levels supported by Adaptec RAID controllers.

The table below shows the number of drives needed and supported for your controller according to RAID level.

Array Type	Maximum Drives Supported / Minimum Drives Required for Adaptec Controller Models				
	2410SA	2810SA	2120S	21610SA	2020ZCR/ 2200S
RAID 0	4 / 2	8 / 2	15 / 2	16 / 2	30 / 2
RAID 1	2 / 2	2 / 2	2 / 2	2 / 2	2 / 2
RAID 5	4 / 3	8 / 3	15 / 3	16 / 3	16 / 3
RAID 10	4 / 4	8 / 4	14 / 4	16 / 4	30 / 4
RAID 50	N/A	8 / 6	15 / 6	16 / 6	30 / 6

Note: Select RAID drives of equal capacity and performance. Otherwise, the RAID tends to be limited in capacity and performance to that of the smallest and slowest drive.

Simple Volume

A simple volume consists of a single drive.

Spanned Volume

A spanned volume is created by joining, or concatenating, two or more drives. The drives do not have to be of equal capacity and are connected end-to-end. A spanned volume offers no redundancy and no performance advantage over a single drive.

RAID 0

A RAID 0 is created by striping data across two or more drives. This striping scheme creates no redundancy to protect the data. However, because the drives share load equally, RAID 0 provides the best read and write performance of any RAID type.

An example of a RAID 0 array is shown below.

RAID 1

A RAID 1 array is created by copying, or mirroring, all data from one drive onto a second drive. This mirroring provides redundancy, ensuring that if one drive fails no data is lost. Redundancy also means that only half of the total capacity is available.

RAID 1 offers no write performance advantage over a simple volume configuration. However, because the drives share read load equally, RAID 1 provides improved read performance. An example of a RAID 1 array is shown above.

RAID 5

This RAID type requires at least three drives. Like RAID 0, data is striped across the drives. However, in RAID 5, parity is stored separately from data, and occupies the equivalent of one drive. The controller generates parity every time data is written to the array, and it is distributed in stripes across all the drives.

In the event of a drive failure, the contents of the failed drive can be rebuilt from the data and parity on the remaining drives.
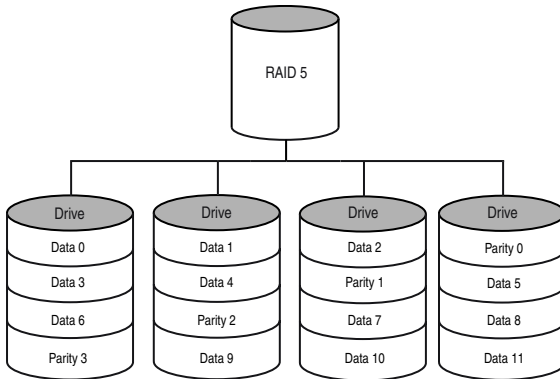

Using parity minimizes the storage cost of redundancy. Because only one drive is used to store parity, a three-drive array, which is the worst case, uses only one-third of the total capacity for redundancy. In larger arrays, the storage cost of redundancy decreases proportionately

RAID 5 write performance is limited by the need to generate parity data for every write. Read performance is good because the load is spread equally across all the drives.

RAID 10

This dual-level RAID type is created by using two or more equal-sized RAID 1 arrays to create a RAID 0. Both read and write performance are improved due to array striping. However, the performance improvement costs additional storage space due to the mirroring of the arrays.
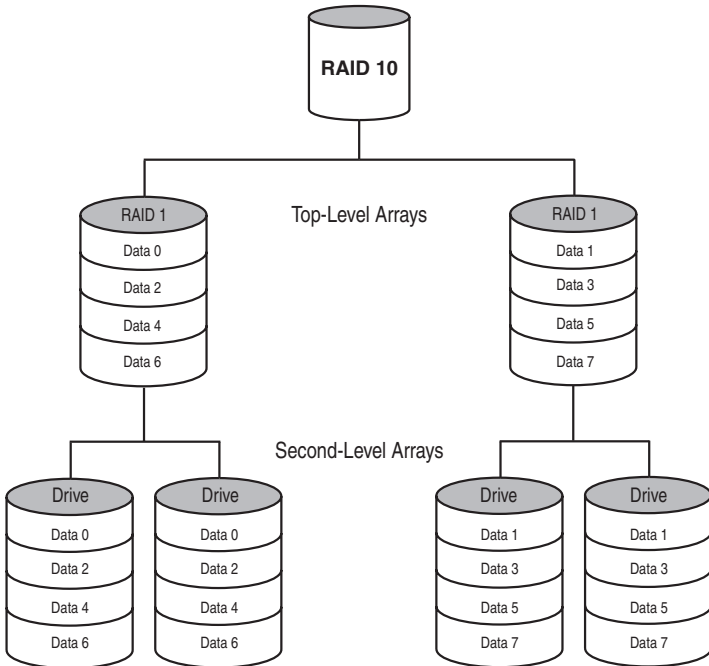
RAID 50

This dual-level RAID type is created by using two or more equal-sized RAID 5 arrays to create a RAID 0. The top level RAID 0 shares the load among the second-level RAID 5s, improving both read and write performance. Parity, used in the second level RAID 5s, provides efficient redundancy.
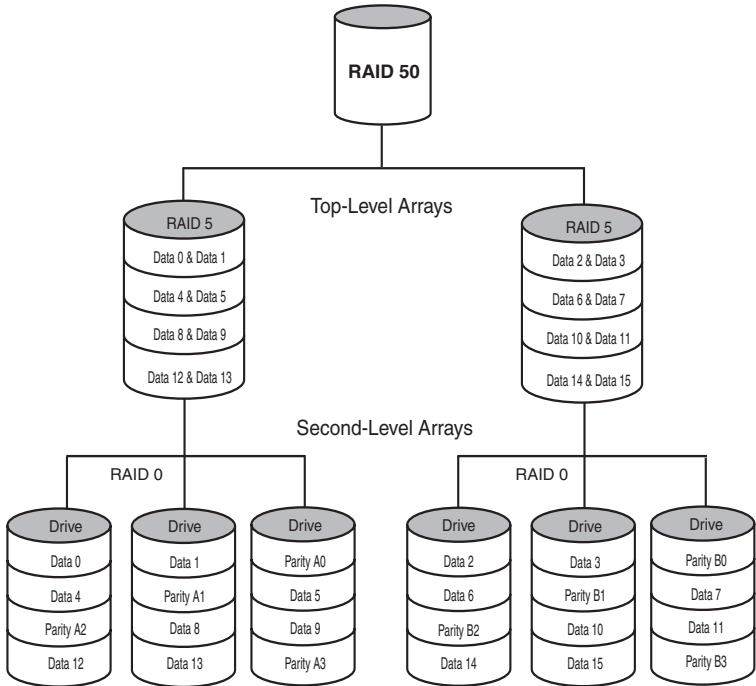
Note: Adaptec 2410SA does not support RAID 50.

F

About SCSI

In this Appendix...

SCSI Device Support

The SCSI RAID controller is designed to work with Ultra320 SCSI hard drives. In addition, the controller operates at reduced performance with all Ultra2 or higher SCSI drives and peripherals, as described in the table below.

Operating Systems	Devices Supported
All	Ultra2 and faster SCSI drives
All except Linux	Tape, CD-ROM, CD-RW, and magneto-optical drives and jukeboxes.

Note: Adaptec *does not* recommend using SCSI devices older than Ultra2 with this controller.

Caution: HVD devices are not supported and will damage your controller.

See *Mixing SE Devices with LVD Devices* on page F-3 for more details.

Setting SCSI IDs

For each controller channel, the SCSI IDs of the devices must be unique numbers between 0 and 15. The controller, itself a SCSI device, is usually set to ID 7 by default. SE drives usually support IDs between 0 and 6.

SCSI enclosures that use SCSI drives with 80-pin SCA connectors typically assign the drive ID automatically when the drive is inserted. You don't need to set device IDs with such enclosures unless your enclosure requires it. For details, refer to the enclosure User's Guide.

The RAID controller ID can be changed to any ID from 0 through 7 using the ARC utility.

Note: *Do not* change the controller ID unless the change is absolutely necessary.

Changing SCSI Termination on the Controller

The default termination for the controller is *Auto Mode* and you will probably never need to change this setting. However, if you do need to change the termination, you can use the SCSI*Select* Controller SCSI Channel Termination option to change the setting to *Disabled*. For details, see .

All these SCSI controllers support multimode SCSI termination.

Enabling CD Drive Support

> **Note:** Adaptec SCSI RAID controllers do not support CD drives in Linux systems.

If you attached a CD drive to the controller, you need to configure the controller BIOS to make the CD drive work, as follows:

1   While the system is starting, press **Ctrl-A** when the controller displays its message on the screen.

2   Select **SCSI*Select* Utility**, then select **Controller Configuration**.

3   Using the arrow keys, enable **CD-ROM Boot Support** and **Removable Media Devices Support**.

4   Press **Esc** until the Reboot window appears.

5   Restart the computer.

Mixing SE Devices with LVD Devices

If you are mixing SE devices with LVD devices:

■   Ensure proper termination by using a cable (like the one in the kit) with a built-in multimode terminator and appropriate device adapters.

■   Disable device termination on all SE devices.

■   Put LVD and SE devices on separate channels for best performance.
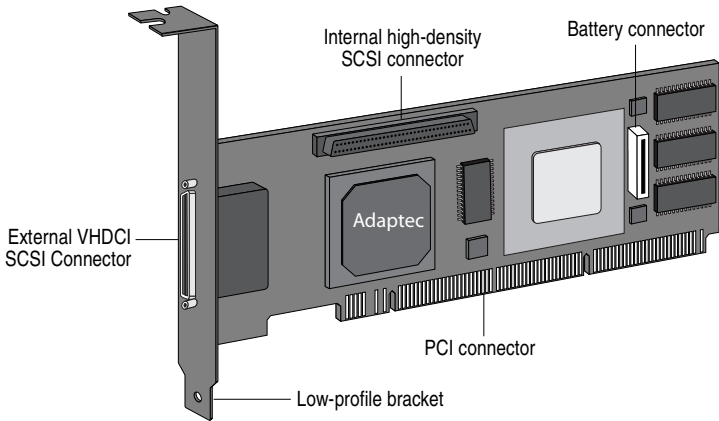
> **Note:** If SE and Ultra320 devices are used together on the same channel, the performance of the Ultra320 devices is reduced to SE performance levels.
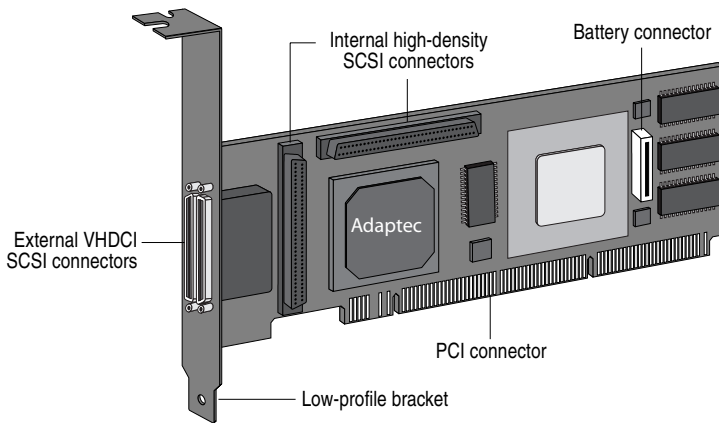
G

Controller Illustrations

This *Appendix* shows the Adaptec RAID controllers.
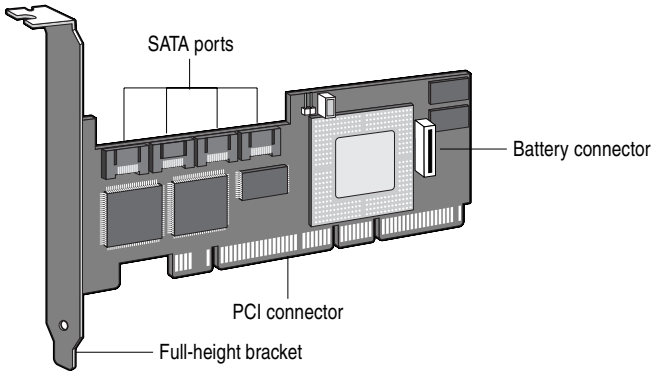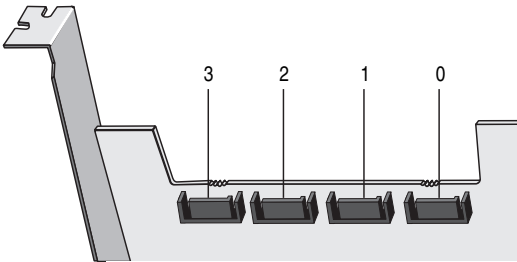

PCI connector

Low-profile bracket
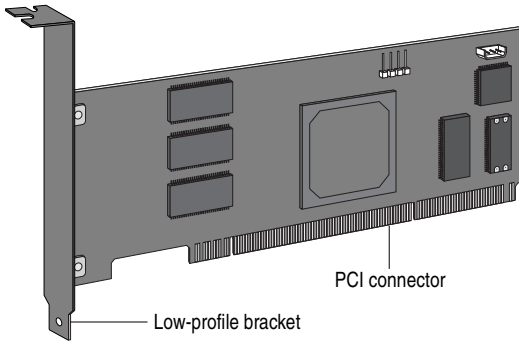
Adaptec 2020ZCR Component Layout

Adaptec SCSI RAID 2120S Component Layout

Adaptec SCSI RAID 2200S Component Layout

SATA ports

Battery connector

PCI connector

Full-height bracket

Adaptec SATA RAID 2410SA Component Layout

3   2   1   0

Adaptec SATA RAID 2410SA Port Numbers

Battery connector

SATA ports

PCI connector

Full-height bracket
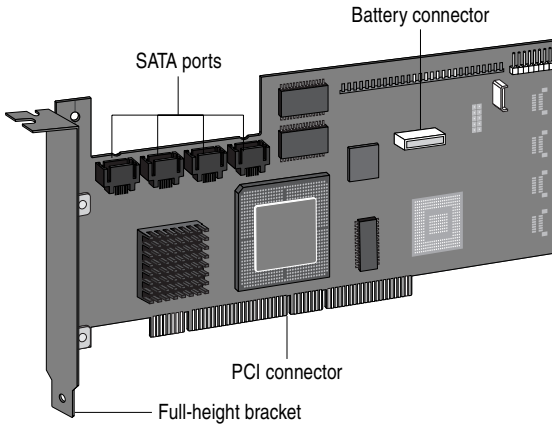
Adaptec SATA RAID 2810SA Component Layout

1   3   4   6

0   2   5   7
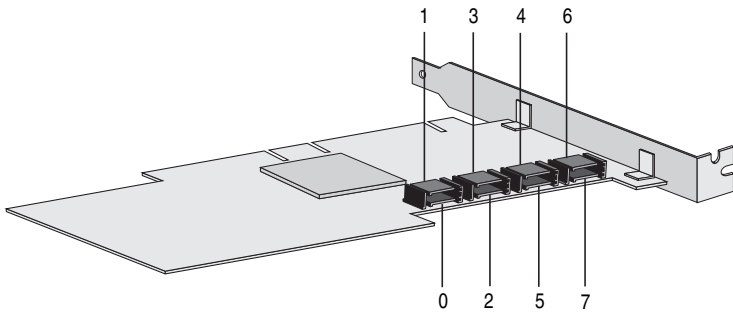
Adaptec SATA RAID 2810SA Port Numbers

Battery connector

SATA ports

SATA ports

PCI connector

Full-height bracket
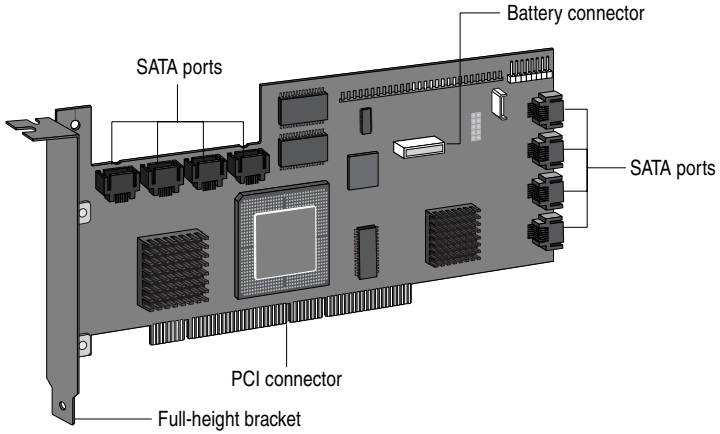
Adaptec SATA RAID 21610SA Component Layout

1   3   4   6

9   11   12   14

0   2   5   7

8   10   13   15
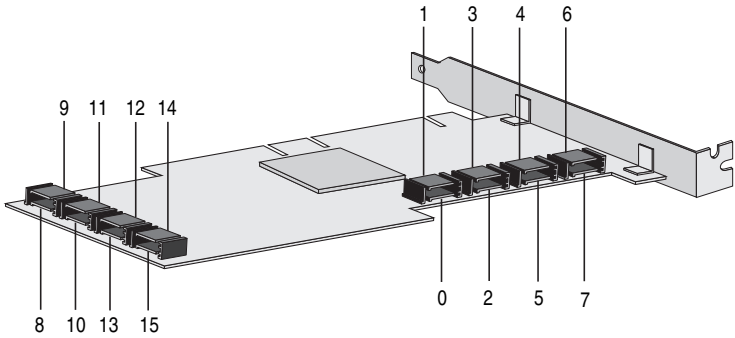
Adaptec SATA RAID 21610SA Port Numbers

H

Specifications

Environmental Specifications

Ambient temperature without battery backup module	0 °C to 50 °C
Relative humidity	10% to 90%, noncondensing
Altitude	up to 3,000 meters

> **Note:** Forced airflow is recommended, but not required.

DC Power Requirements

Ripple and noise	50 mV peak-to-peak (max)
DC Voltage	5 V ± 0.5 V

Current Requirements

Adaptec Model	Maximum Current (A)
2020ZCR	1.5 A @ 3.3 VDC; 0.75 A @ 5 VDC
2120S	2.50 A
2200S	2.72 A
2410SA	1 A
2810SA	2.1 A @ 5 VDC
21610SA	3.5 A @ 5 VDC

Glossary

A

activity

See *task*.

ACU

Array Configuration Utility. Used to create, configure, and manage arrays from the controller's BIOS or MS-DOS.

array

A logical disk created from available space and made up of one or more partitions on one or more physical disks. Arrays are typically used to provide data redundancy or enhanced I/O performance. See also *container*, *volume*, *spanned volume*, and *RAID signature*.

Also known as a *container*.

array initialization

See *initialize*.

available space/partition

Unused space on an initialized disk from which logical devices (arrays) are created. When an array is deleted, the space that it used is returned to the available space pool.

B

background consistency check

Consistency check performed as a background process. See also *consistency check command*.

bad partition

partition that is in an unknown state.

bootable array

Array configured as the boot device.

build

Background initialization of a redundant array. The array is accessible throughout. RAID 1 copies the contents of the primary drive to a secondary drive. See also *clear*.

bus

See *channel*.

C

cache

Fast-access memory on the controller that serves as intermediate storage for data that is read from, or written to, drives.

capacity

Total usable space available in megabytes or gigabytes.

channel

Any path, or *bus*, used for the transfer of data between storage devices and a RAID controller.

chunk

See *stripe*.

clear

Foreground initialization of a fault-tolerant array. A *clear* operation zeros all blocks of the array. The array is not accessible until the clear task is complete.

concatenation

Joining of physical or logical drives in sequential order.

consistency check command

The controller continuously performs a verification on a redundant array to data integrity. In the case of RAID 1 or 10, consistency checks assure that the data between like blocks match. In the case of a RAID 5, consistency checks assure that data in the stripe and the calculated parity for the stripe match.

container

See *array*.

D

dead partition

See *failed*.

degraded

A redundant (for example, a RAID 1) array in which one or more members have failed. The data is intact but redundancy has been compromised. Any further failure would cause the array to fail and result in data loss.

dirty data

Data that has been written to a *cache*, but which has not been "flushed" out to its final destination.

disk

A nonremovable platter in a hard drive, or removable media used in a CD drive, floppy disk drive, or Zip drive. See also *disk ID*, *drive*, and *hard disk, hard drive*.

disk ID

Unique disk identifier that consists of the channel number, ID, and LUN (channel:ID:LUN), for example, 1:04:0. See also *channel*.

drive

Device used for storing data. May contain one or more removable or nonremovable, writable or read only media. See also *hard disk, hard drive*.

drive LED

Indicator light that illuminates during read or write operations.

E

event

Notification or alert from the system, indicating that a change has occurred.

event log

File used to maintain information about prior controller activities or errors.

event notification

Process for transmitting events.

F

failed

State of a non*redundant* array that has suffered a single drive failure, or a redundant array that has suffered multiple drive failures. A failed array is inaccessible and data is lost.

failed partition

A *partition* that is no longer usable by an array because it is either logically bad and therefore no longer needed, or physically damaged.

failover drive

See *hotspare*.

fault-tolerant array

Refers to an array that can continue to function after a disk drive failure without loss of data. See also *redundant.*

foreign disk

Disk that has previously been initialized on another Adaptec RAID controller. The RAID signature on the disk allows the RAID controller to identify whether or not the disk was initialized on the controller it is currently connected to.

free space/partition

See *available space/partition*.

H

hard disk, hard drive

Basic unit of nonvolatile, nonremovable, magnetic storage media. See also *drive*.

hot swap

To remove a component from a system and install a new component while the power is on and the system is running.

hotspare

A hard drive, an array member, that is not used in day-to-day data storage but, instead, is reserved for use as a replacement for one of the other drives in the array in the event of a failure.

I

impacted

An impacted array is one which has been created, but for some reason the initial build operation did not complete. All member drives are present and operational, and all data written to the array is protected. To optimize the array, run a Verify with Fix task.

initialize

Process of preparing a disk for use by the controller. When a disk is initialized, the controller records the RAID signature on the disk.

initialized array

An array that is ready for data reads and writes. Arrays can be initialized by *build* or *clear*.

L

legacy disk

Disk that contained a valid *partition* table when connected to the controller. The controller manages the disk as a legacy disk array where there is a one-to-one logical-to-physical mapping of array to disk.

logical device

Volume comprised of space from one or more physical drives and presented to the operating system as if it were a single storage unit.

low-level format

Process performed by the drive firmware that completely removes the file system from the disk.

M

migration

See *reconfiguration*.

mirrored array/mirroring

See *RAID 1 on page E-2*.

monitoring

Process of receiving, displaying, and logging system events.

multipartition array

Array with multiple operating systems or MS-DOS partitions.

O

offline array

Array that can no longer be accessed.

optimal

The state of an array when it is fully operational. For redundant arrays, the entire array is protected.

P

partition

Contiguous area of a physical drive that makes up some or all of an array. When an array is created, space is automatically converted into partitions.

phantom object

Object that represents a component that cannot be configured by the controller management software; for example, a missing drive.

Q

quick init

An array initialized using the Quick Init option is available immediately, with no on-going background controller activity. All data written to an array that has been quick initialized is protected.

R

RAID

Redundant Array of Independent Disks (alternative definition Redundant Array of Inexpensive Disks).

RAID signature

The area on each disk reserved for use by the RAID controller.

RAID volume

Concatenates two or more arrays of the same type.

rebuild

Background regeneration of redundant data on a RAID 1.

reconfiguration

Process of expanding an array or migrating an array from one RAID type to another; changing the *stripe size* of a RAID 0, or moving a logical device's *partitions* to other disks.

redundant

The ability of an array to maintain operability when one or more hardware failures occur. RAID 1 is an example of a redundant array. In the event of a drive failure, redundant arrays can be restored to normal operation by replacing the failed drive and rebuilding the array.

rescan

Process of updating the current screen to show all currently available resources.

S

segment

Disk drive or portion of a disk drive used to create a logical device. A disk can include RAID segments and available segments. A RAID segment is part of a logical device; it can be used by only one logical device at a time. Available segments can be used to define a new logical device. If the disk is not part of any logical device, the entire disk is an available segment.

Serial ATA (SATA)

A successor to ATA that uses a serial, instead of parallel, interface.

simple volume

A volume made up of disk space from a single disk. It can consist of a single region on a disk or concatenated, multiple regions of the same disk.

single-level array

Array created from one or more partitions. See also *volume*, *spanned volume*, *RAID signature*, and *RAID 1 on page E-2*.

spanned volume

A simple volume that spans two or more drives.

spare

See *hotspare*.

stripe

Contiguous set of data distributed across all the disks in an array. A striped array distributes data evenly across all members in equal-sized sections called *stripes*.

stripe size

The amount of data in each section of a striped array.

striped array

See *RAID signature* and *RAID 5 on page E-3*.

T

task

An operation that occurs only on the RAID controller, asynchronous to all other operations; for example, initializing a disk or verifying an array. Some tasks can take an extended period of time, particularly if the RAID controller is also performing intensive data I/O while the task is running.

V

verify

See *consistency check command*.

volume

See *simple volume*, *spanned volume*.

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Part Number: 513853-06, Ver. AA   03/04   MKL